OPERATING PRECAUTIONS

GENERAL PRECAUTIONS

- Federal Law restricts this device to sale by or on order of a physician.
- Infant radiant warmers should be used only by properly trained personnel as directed by an appropriately qualified physician aware of currently known hazards and benefits.
- The functional checkout procedure should be performed before each use and after disassembly for cleaning, servicing or maintenance. Refer to qualified service personnel if the unit does not perform as specified.
- The Cart/Bassinet End and Side panels cannot be used for pushing or pulling the Cart/Bassinet and or Warmer.
- Do not leave the infant unattended in the Cart/Bassinet when the side panels or the front panel are folded down.
- To avoid overheating or underheating, skin temperature must be continuously monitored and controlled either manually or automatically. Rectal temperature should never be used to control skin temperature.
- To avoid overheating or underheating when operating in manual mode, observe the infant constantly and monitor the temperature using the temperature probe supplied with the equipment or another electronic thermometer.
- The skin temperature sensing probe must be in direct contact with the skin to provide accurate monitoring of the infant's skin temperature. Failure to maintain direct skin contact can result in overheating and possible burning. Check infant's condition at least every fifteen minutes for correct Sensor attachment, reddened skin areas, and proper skin temperature.
- The skin temperature sensing probe should be placed at least 1.5 inches from any transcutaneous monitor ($TcPO_2$ or $TcPCO_2$) probe to prevent false temperature indications. The skin temperature probe should not be placed on an area previously used by a $TcPO_2$ or $TcPCO_2$ probe.
- To avoid overheating the skin, the location of the skin temperature probe must be such that the skin around the Sensor is in direct line with the radiation from the warmer. Do not place anything between the radiant warmer and the infant that will interfere with the radiation from the warmer.
- Radiant warming increases insensible water loss. Appropriate measures to maintain proper fluid balance should be considered.
- For effective heating, make sure the Warmer Module is positioned on the center axis and locked with its detent.
- This Warmer is intended for use with the Cart/Bassinet. If the Warmer is used to warm the mother immediately after delivery, all warnings and instructions should be followed with particular regard to the heater-to-mattress distance and skin probe location. Avoid placement of objects near the mother which can absorb heat and become hot to the touch.
- Compressed gas cylinders, such as oxygen cylinders, can become hazardous projectiles if the gas is released rapidly due to damage or other causes. Cylinders must be securely fastened.
- To avoid overheating the Warmer, do not place objects (equipment, blankets, clothing or sterile packs) on top of the Warmer.

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OPERATING PRECAUTIONS (Continued)

- Avoid placement of objects between the infant and the Warmer Module that can block heat transfer or absorb heat. These objects may be heated directly by the heater and can cause skin burns.
- Temperature uniformity (per IEC 601–2–21) across the mattress surface may not be maintained when the Bassinet is tilted in the 5– and 10–degree positions.
- During calibration, inspect the secondary reflector directly under the warmer heater element for particles. If particles are present, replace the heater element. The life expectancy of the heater element is 1000 hours of operation.
- Evidence that the safety certification of the ACCESSORY has been performed in accordance with the appropriate IEC 601–1 and/or IEC 601–1–1 harmonized national standard.

RESUSCITATION PRECAUTIONS

- A one–way valve is installed at the **Patient Outlet** connection. This valve opens when pressure in the hose delivering gas to the patient falls below –4 cm H_2O. Its purpose is to allow patient inspiration in the unlikely event of failure of the gas supply.
- A humidifier, when used, must be placed between the **Patient Outlet** connection and the patient circuit. DO NOT PLACE A HUMIDIFIER IN THE SUPPLY LINE.
- Humidifier must have low series flow resistance and not be placed between exhalation valve and patient airway.
- Gas going to the patient should not be super–saturated as evidenced by excessive condensation in the tubing. Condensation droplets on the inner walls of the tubing are normal.
- Periodic blood gas measurements should be made to ensure proper levels of ventilation.
- Always confirm the airway pressure relief valve setting before patient use.
- Confirm that the oxygen/air blender control of the **Blended Gas Supply** Module is correctly set prior to use.
- Confirm that the patient circuit contains all the parts needed prior to use.
- Ensure that the patient breathing circuit connections are secure and free of obstructions.
- The **Aux Outlet** circuit does not provide adjustable pressure limiting.
- Auxiliary Gas Supply Pressure is internally limited to 160 cm H_2O. Always use a patient resuscitation circuit that includes appropriate pressure relief.
- Always monitor **Airway Pressure** and/or provide appropriate pressure relief during infant resuscitation. Confirm that the oxygen supply is turned off and that the equipment is disconnected from the oxygen supply when performing cleaning and maintenance procedures; a fire and explosion hazard exists when performing cleaning and/or maintenance procedures in an oxygen–enriched environment.
- Gas supplies (O_2 and Air) should always be clean and dry. Water/Trap Filters should be used in the supply lines if necessary.
- All hoses should be securely fastened to fittings. Hand–tighten to avoid damage to fittings.
- Gas supplies should be maintained at 40 to 75 psi.
- Flow restrictions (e.g., flowmeter, valve, etc.) must not be placed in the supply line.
- If a compressor is used as the air source, steps should be taken to filter and dehumidify the room air before introducing it into the Gas Supply Module.

OPERATING PRECAUTIONS (Continued)

ELECTRICAL PRECAUTIONS

- An electrical shock hazard exists within the Warmer Module and Controller. Any substitution of components within the Controller or Warmer Module may impair the intrinsic safety of the unit. Service should be performed by qualified personnel.
- Connect the power cord only to a properly grounded receptacle that is approved for hospital use and of the correct voltage. **DO NOT USE EXTENSION CORDS.**
- Use only with power cords supplied with the Warmer.

EXPLOSION PRECAUTIONS

- Do not use in the presence of flammable anesthetics.
- Confirm that the oxygen supply is turned off and that the equipment is disconnected from the oxygen supply when performing cleaning and maintenance procedures; a fire and explosion hazard exists when performing cleaning and/or maintenance procedures in an oxygen–enriched environment.

OXYGEN PRECAUTIONS

- Improper use of supplemental oxygen may be associated with serious side effects including blindness, brain damage, and death. The risks vary with each infant. The method, the concentration, and the duration of oxygen administration should be prescribed by the attending physician.
- If it is necessary to administer oxygen in an emergency, the attending physician should be notified immediately.

NOTE: *See the current edition of "Guidelines for Perinatal Care" of the American Academy of Pediatrics/The American College of Obstetricians and Gynecologists.*

- The oxygen concentration inspired by an infant does not predictably determine the partial pressure of oxygen (PO_2) in the blood. When deemed advisable by the attending physician, blood PO_2 should be measured by accepted clinical techniques.
- Oxygen flow rates cannot be used as an accurate indication of oxygen concentrations. Oxygen concentrations should be measured with a calibrated oxygen analyzer at intervals directed by the attending physician.
- Keep matches and all other sources of ignition out of the room in which the Warmer is located and keep spark–producing equipment or any sources of ignition out of the Bassinet. Wood, textiles, oils, and other combustibles are easily ignited and burn with great intensity in air enriched with oxygen.
- Although oxygen compatible materials are used in the oxygen delivery system, special care must be taken when high pressure oxygen such as found in a medical oxygen cylinder is used. Violent ignition of oil, grease, greasy substances, small particles of dust, dirt or other particulate contaminants (even small particles of metal), can occur in the presence of high pressure oxygen if their ignition temperature is reached. An instantaneous increase in temperature can occur due to friction, particle acceleration, or adiabatic compression, if the oxygen cylinder valve is opened too rapidly. **SERIOUS INJURY MAY RESULT!** Always observe the following precautions:
  - Oil, grease, greasy substances, dust, dirt and other particulate contaminants must be kept away from oxygen regulators, cylinder valves, tubing and all other oxygen equipment.

OPERATING PRECAUTIONS (Continued)

- Always open oxygen cylinder shut–off valves **very slowly** and **carefully.**
- On high pressure oxygen cylinders use only pressure regulators or reducing valves approved for oxygen service. Do not use oxygen pressure regulators or reducing valves for air or gases other than oxygen as they may be hazardous. Operate such devices in strict accordance with the manufacturer's recommendations.
- When new or replacement oxygen cylinders are to be installed, they should have their outlet ports cleared by cracking the cylinder valve momentarily before attachment to the equipment.

LOW FLOW MICROBLENDER WARNINGS

- **If either the air or oxygen gas source pressure is reduced or increased creating a pressure differential of 30 psi, the microblender alarm will sound. This condition significantly alters the FiO_2 and flow output from the microblender.**
- **Always operate the low flow microblender with clean/dry medical grade gases.**
- **Air inlet water filters are recommended for use with the low flow microblender.**
- **The level of oxygen and the partial pressure of oxygen within the patient's blood (PaO_2) should be monitored.**

TABLE OF DEFINITIONS AND SYMBOLS

NOTE, IMPORTANT, PRECAUTION, CAUTION, AND WARNING

NOTE: *A Note is inserted in text to point out procedures or conditions which may otherwise be misinterpreted or overlooked. A Note may also be used to clarify apparently contradictory or confusing situations.*

IMPORTANT: *Similar to a Note but used when greater emphasis is required.*

PRECAUTION: *A Precaution is supplemental information to assist the user in the safe and effective use of the equipment.*

CAUTION: A Caution is inserted in text to call attention to a procedure which, if not followed exactly, can lead to damage or destruction of the equipment.

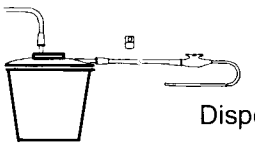
WARNING: A Warning is inserted in text to call attention to dangerous or hazardous conditions inherent to the operation, cleaning, and maintenance of the equipment which may result In personal injury or death of the operator or patient.

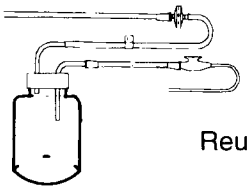
SYMBOLS

Attention: consult accompanying documents.

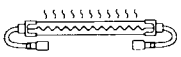
Type B equipment with an F–type isolated (floating) applied part.

Danger! High Voltage!


Disposable Suction Bottle

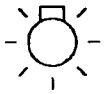

Reusable Suction Bottle

Patient


Heater Element

Suction Line Filter

Load Symbol


Examination Light

Examination Light Switch

Mode Control Key

Temperature Override Mode Key

Keypad Lock Key

Set Temperature Keys

Power On/Off Switch

Celsius/Fahrenheit Selection Key

Silence/Reset Key

Procedural Silence Indicator

Apgar Timer Keys

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SECTION 1
GENERAL INFORMATION

1.1 INTRODUCTION

This manual provides instructions for installation, use, operator maintenance and troubleshooting of the equipment. Hill-Rom Air-Shields cannot be responsible for the performance of the equipment if the user does not operate the equipment in accordance with the instructions, fails to follow the maintenance recommendations in Section 5 of this manual or effects any repairs with unauthorized components. Calibration and repair should be performed only by qualified service personnel. Service manuals are available from Hill-Rom Air-Shields.

This manual should be read, thoroughly understood, and be readily accessible to all personnel who will be working with the equipment. The manual should be stored with the equipment when not in use. If there is anything you do not understand, please contact your Hill-Rom Air-Shields' representative for further information.

1.2 DESCRIPTION

The ***Resuscitaire® Birthing Room Warmer*** is designed specifically for birthing room use. The ***Resuscitaire® Birthing Room Warmer*** consists of a detachable Cart/Bassinet, Warmer, and a Controller module which provides heat control, monitoring of skin temperature and Apgar timing. The ***Resuscitaire® Birthing Room Warmer*** also includes an optional resuscitation package with suction and oxygen delivery. Other options include a reserve gas supply and blender.

1.3 SPECIFICATIONS

Specifications for the ***Resuscitaire® Birthing Room Warmer*** are provided in Table 1.1. All specifications are subject to change without notice.

TABLE 1.1 SPECIFICATIONS

POWER REQUIREMENTS ..... 120V, 60 Hz, 750W

OVERLOAD PROTECTION ..... Dual 12A Circuit Breakers

CHASSIS LEAKAGE CURRENT ..... Less than 300 µA

EXAMINATION LIGHT ..... >100 Foot Candles (0.12 lumens/cm^2)

ALARMS

High Temperature ..... Activates if Skin Temperature Probe is attached and the skin temperature sensor reaches 39.0 °C. Resets at 38.5 °C.

Check Patient ..... Activates in Manual Mode after 10 minutes. Remains on with audible alarm every 30 seconds for 5 minutes; totalling 15 minutes. Then the heater is turned *Off*.

Apgar Timer ..... Activates at the 1–, 5– and 10–minute Apgar Time intervals.

Power Fail ..... Activates when there is a loss of power.

Probe ..... Activates if Skin Temperature Probe fails (open or short).

System Fail ..... Indicates system failure; refer unit to service immediately.

Baby Temp ..... Activates if Baby Temperature fluctuates 1°C above or below set point.

Electrical Module Audio Alarms ..... Tone Frequency: 1.2 KHz maximum
Three–stage sound level: 15 seconds low, 15 seconds medium, then high.

Blender Module Pneumatic Audio Alarm ..... Vibrating Reed.

DISPLAYS

Skin Temperature Display

Accuracy ..... ± 0.2 °C for 31 °C to 37 °C (88 °F to 98.6 °F)
Resolution ..... 0.1 °C (0.5 °F)

Apgar Timer Display

Range ..... 0 to 59 minutes, 0 to 59 seconds
Resolution ..... 1 second
Accuracy ..... 0 ± 0.5 second

MANUAL HEAT CONTROL ..... Adjustable in 10% increments from zero to full power (100 %)

DATA PORT ..... 2400 Bits/second fixed Baud Rate. RS232C Compatible

DIMENSIONS AND WEIGHT–FREE STANDING WARMER

Height ..... 74 inches (188 cm)
Width (side to side) ..... 28 inches (102 cm)
Depth (front to back) ..... 40 inches (89 cm)
Weight (without tanks) ..... 170 lbs (77 kg)
Warmer Head Rotation (right and left) ..... 90 Degrees

TABLE 1.1 SPECIFICATIONS (Cont.)

DIMENSIONS AND WEIGHT – Cart/Bassinet

Height to Mattress	38.5 inches (98 cm)
Width (to outside of bumper)	24 inches (61 cm)
Length (to outside bumper)	31 inches (79 cm)
Weight	< 160 lbs (<73 Kg)
Mattress Tilt	5 and 10 degrees Reverse Trendelenburg. Infant's head should be toward front of warmer.

TOTAL SYSTEM DIMENSIONS AND WEIGHT

Height	74 inches (188 cm)
Width	28 inches (71 cm)
Length	48 inches (122 cm)
Weight	<320 lbs (< 152 Kg)

ACCESSORY WEIGHT LIMITS

Infusion Pump/IV Pole	5 lbs (2.2 Kg)
Monitor Shelf	10 lbs (4.5 Kg)

ENVIRONMENTAL

Operating Temperature Range	18 °C to 30 °C ambient
Storage Temperature Range	– 20 °C to +45 °C ambient
Relative Humidity Operating Range	5% RH to 95% RH, non–condensing

RESUSCITATION

Wall Supply Pressure	40 to 75 psi
Cylinder Pressure	2900 psi max
Cylinder Diameter	4–5 inches(10–12 cm)
Patient Gas Supply	
Airway Pressure Limiting Operator–Adjustable	0 to 50 cm H_2O (4.9 kPa) ± 10%
Fixed Pressure Relief, Factory Set	60 cm H_2O (5.9 kPa) ± 10%
Suction Circuit	
Adjustable Suction Intensity	0 to 150 mmHg (0 to 20 kPa)
Auxiliary Supply	
Auxiliary Flow Range	0 to 15 LPM
Auxiliary Pressure Limit	160 cm H_2O (16 kPa) ± 10%

1.4 EQUIPMENT PROVIDED

- *Bassinet* – The Bassinet provides maximum visibility and access to the infant. The Bassinet tilts up in the rear to 5 and 10 degrees and provides for X–ray Cassette tray (optional) insertion.
- *Warmer Module* – The Warmer Module houses a heating element and an Examination Light for special procedures.
- *Controller* – The Controller provides pre–warm, manual heat control, automatic skin temperature servo–control and contains an Apgar Timer, Skin Temperature monitor and probe.
- *Resuscitation Module (optional)* – The Resuscitation Module contains a suction circuit, a patient oxygen delivery circuit with airway pressure relief and an auxiliary oxygen delivery circuit.

1.5 FACTORY INSTALLED OPTIONS

- Resuscitation Module
- Integrated Precision Blender
- Gas Supply Module
  - O_2 Pipeline and Cylinder
  - O_2/Air Pipeline and Cylinder

1.6 FIELD INSTALLED ACCESSORIES (Refer to Section 6 for Part Numbers)

- X–ray Cassette Tray
- Air Hose Assembly
- Oxygen Hose Assembly
- Monitor Shelf
- I.V. Pole
- Drawer Organizer

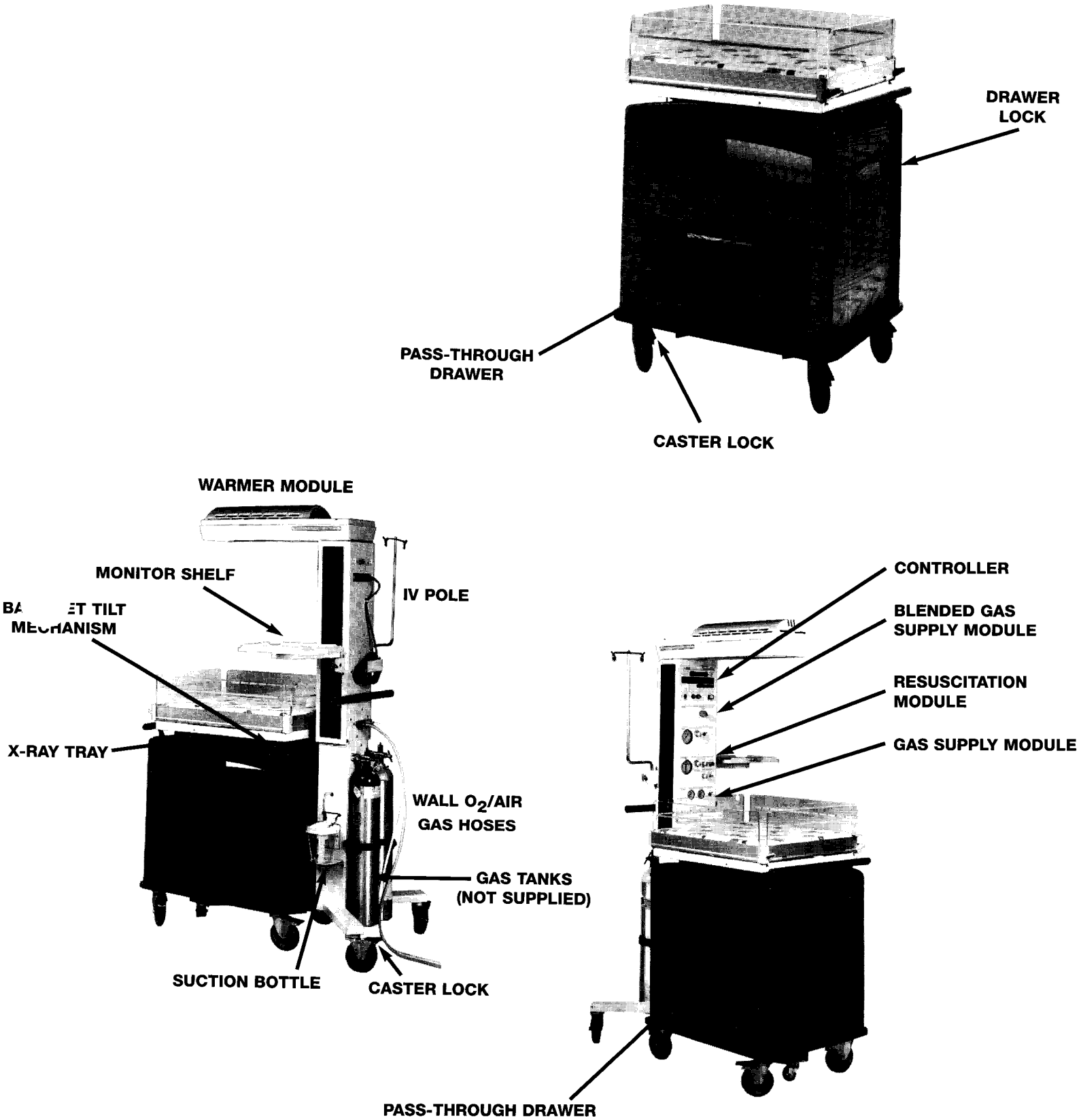


FIGURE 1.1 EQUIPMENT PROVIDED WITH FACTORY INSTALLED OPTIONS AND FIELD INSTALLED ACCESSORIES

SECTION 2
INSTALLATION

2.1 UNPACKING

The ***Resuscitaire® Birthing Room Warmer*** is shipped in two cartons. One carton contains the following assemblies:

- Upper Post Assembly
- Lower Post Assembly
- Warmer Module Assembly
- Post Handle
- Any user installed Accessories that were ordered

The other carton contains the Cart/Bassinet.

2.2 ASSEMBLY OF THE WARMER (REFER TO FIGURE 2.1)

When removing the equipment from the carton, use care not to scratch or otherwise damage unprotected surfaces; remove all packing material.

NOTE: *If a Monitor Shelf is to be installed on the unit, refer to the instructions provided with the Monitor Shelf and install the weights provided with these accessories in the bottom of the Lower Post.*

1. **REMOVE THE CONTROLLER** (3) from the Upper Post (2).

CAUTION: Two persons of sufficient strength are required when performing Steps 3 through 6.

2. **REST THE UPPER POST** (2) on top of the Lower Post opening.
3. **CONNECT THE SUCTION HOSE** (4) to the Suction Hose (11). Release the joined Suction Hoses from the Neat Clip inside the Lower Column.
4. **MOUNT THE UPPER POST** (2) on the Lower Post using four 10 – 32 x 3/8 inch screws (16) provided.
5. **INSTALL TWO 10 – 32 X 3/8 INCH SCREWS (6) IN THE UPPER HOLES OF THE UPPER POST.** Do not tighten the screws.
6. **RAISE THE WARMER** (7) above the open end of the Upper Post (2) and insert the Power Cable (10) into the open end of the column.
7. **SLOWLY LOWER THE WARMER** (7) onto the Upper Post. Tighten the upper screws and install the remaining four 10 – 32 x 3/8 inch screws (6).
8. **THREAD THE WARMER POWER CABLE** out through the Controller opening. Connect the Power Cable (10) to connector J4 on the Controller (3).
9. **REMOUNT THE CONTROLLER** on the Upper Post.
10. **MOUNT THE BACK COVER** (1) on the Upper Column using the six 8 – 32 x 3/4 painted screws (5).
11. **MOUNT THE HANDLE** (12) on the Post using the two 10 – 32 x 2.6 inch Phillips Head Screws, No. 10 Lock Washers and Spacers (13) (14) (15).
12. **CONNECT THE LINE CORD** to the Power Connector on the rear of the Controller (refer to Figure 4.2).
13. **SECURE THE LINE CORD** to the Back Cover (1) using the Cable Clamp (8) and 8 – 32 x 3/8 screw (9).

CAUTION: Securing the Line Cord to the Back Panel is required to prevent removal of the Controller chassis with the ac power applied.

14. **INSTALL ANY ACCESSORIES** that were ordered using the installation instructions provided with the accessory.

2.3 ASSEMBLY OF THE CART/BASSINET

1. Refer to Paragraph 5.6, Step 4, and install the Rear and Side Panels. Raise the Front Panel from its storage slot and lock it in place.
2. **ENGAGE THE CART/BASSINET TO THE WARMER** by pushing the Cart/Bassinet straight onto the Warmer until it latches. Pull on the Cart/Bassinet to ensure that it is latched properly.

   To disengage the Cart/Bassinet from the Warmer, push and hold the release switch (Figure 4.14) and pull the Cart/Bassinet away from the Warmer.

PARTS LIST

Screw, 10 – 32 x 3/8 (Qty 10)	99 041 36
Screw, 10 – 32 x 2.6 (Qty 2)	99 045 30
Screw, 8 – 32 x 3/4 (Qty 6)	99 032 85
Screw, 8 –32 x 3/8 (Qty 1)	99 031 38
No. 10 Lock Washer	99 124 16
Spacer (Qty 2)	99 124 61
Cable Clamp	17 725 64
Post Handle	81 005 73

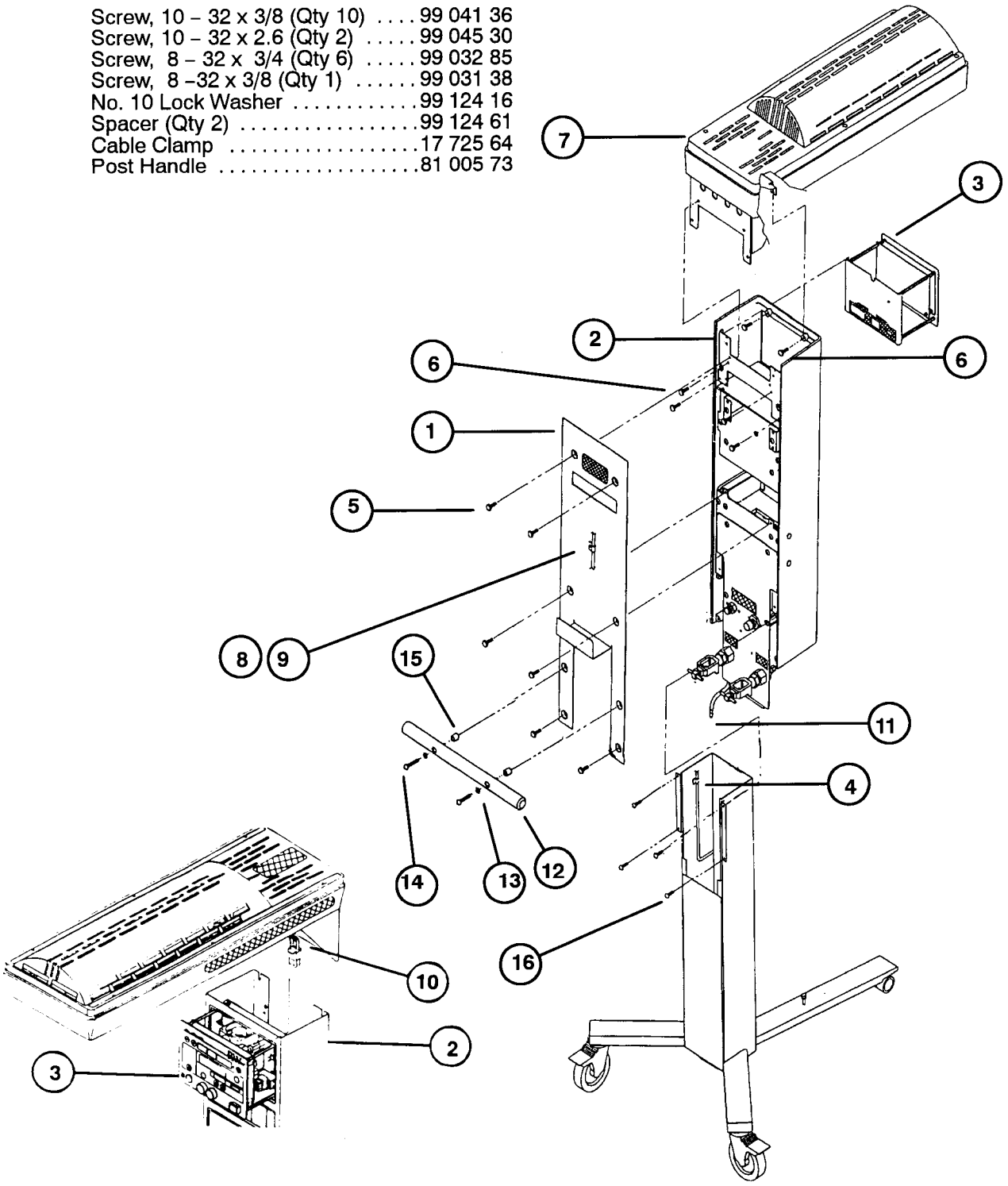


FIGURE 2.1 INSTALLATION

SECTION 3
FUNCTIONAL DESCRIPTION

3.1 GENERAL

This section provides a functional description of the equipment.

3.2 FUNCTIONAL DESCRIPTION

3.2.1 WARMER MODULE

The Warmer is controlled by a Controller which provides **Pre–Warm** Mode, **Manual** Mode heater control, or **Baby** Mode (automatic skin temperature control). An Examination Light provides added illumination of the mattress area. A Warmer Head Pivot permits the Warmer to be pivoted to either side for X–ray procedures. In addition, when the Warmer is pivoted, it can be powered and provide heat.

3.2.2 CART/BASSINET

The Bassinet is designed to provide maximum function and utility to aid in the care of the newborn. It is detachable so that the infant can be transported to the NICU, the general nursery or another area of the hospital. The side and front panels may be folded down to permit maximum access to the infant. The mattress may be tilted up in the rear at a 0, 5– or 10–degree angle. Openings are provided on each side of the Bassinet for the insertion of the optional X–ray Cassette Tray.

3.2.3 CONTROLLER

At power–up, the microprocessor within the Controller performs a series of diagnostic tests to confirm the proper operation of the system. During this time, all displays and indicators are lighted (except **Power Fail**) and an audible tone is sounded.

When powered up, the system initializes in **Pre–Warm** Mode, the Controller will start the heater at 100% power and maintain that setting for three minutes, reduce to 60% for 12 minutes and then reduce the heater power to 30%.

When operating the Controller in the **Manual** Mode, the operator can adjust the heater power from 0 to full power. After 10 minutes of operation in the Manual Mode, a **Chk Patient** Alarm occurs.

Failure to acknowledge the Check Patient Alarm by pressing the **Silence/Reset** Key within the next 5 minutes will cause the heater to be shut down.

The Apgar Timer displays the elapsed time and sounds an audible dual tone to alert the operator that 1, 5, and 10 minutes have elapsed since the timer was activated.

When operated in the **Baby** Mode, the Controller utilizes a Skin Temperature Probe, connected between the Controller input and the infant, to automatically adjust the heater output of the Warmer Module to maintain a digitally displayed preset **Set Temperature**.

The **Keypad Lock** Key, when pressed, renders the Up/Down Arrows and Select Mode Keys inactive or active.

Also included is a Procedural Silence Timer to block out **Baby Temp** audible Alarms during routine procedures.

3.2.4 BLENDER MODULE (OPTIONAL)

The Blender Module provides blended oxygen from 21% to 100% to the **Patient Outlet** on the Resuscitation Module.

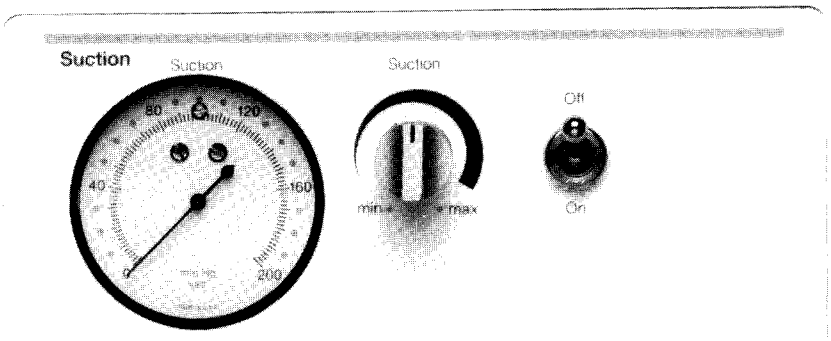
3.2.5 RESUSCITATION MODULE (OPTIONAL)

The Resuscitation Module contains pneumatic circuitry necessary for infant resuscitation. Controls and displays for the module are located above and to the rear of the Bassinet.

The Resuscitation Module consists of the following components:

- **Suction** – The **Suction** Circuit (reusable or disposable) is driven by a gas powered venturi actuated vacuum generator which provides a negative pressure for suctioning the patient's airway. The suction pressure is indicated on the **Suction** Gauge (Figure 3.1). Suction pres-

sure may be adjusted using the **Suction** Control or turned on and off using the **On/Off** Switch. A fixed internal relief valve limits the maximum suction level to 150 mmHg.



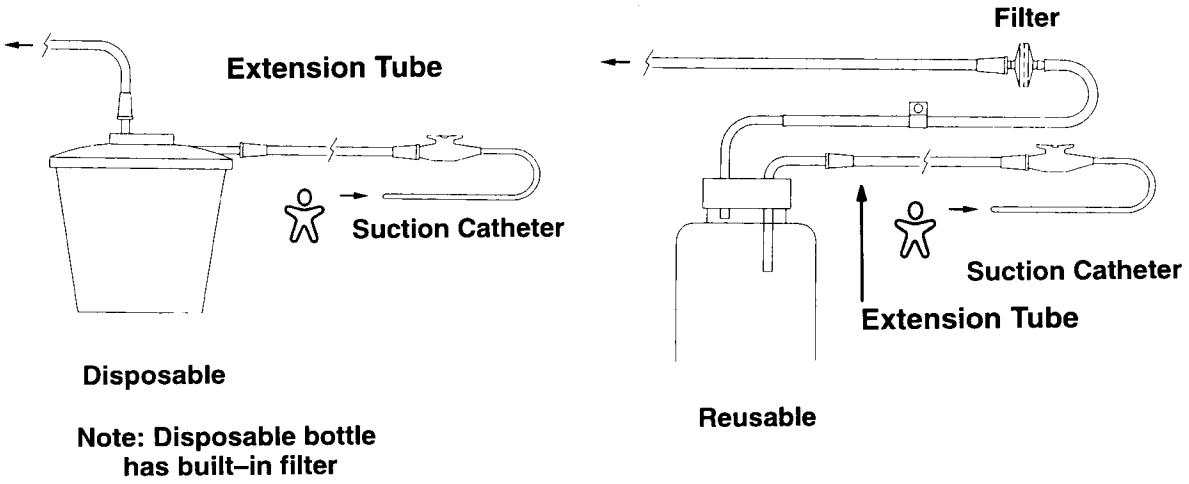


FIGURE 3.1 SUCTION FUNCTIONAL BLOCK DIAGRAM

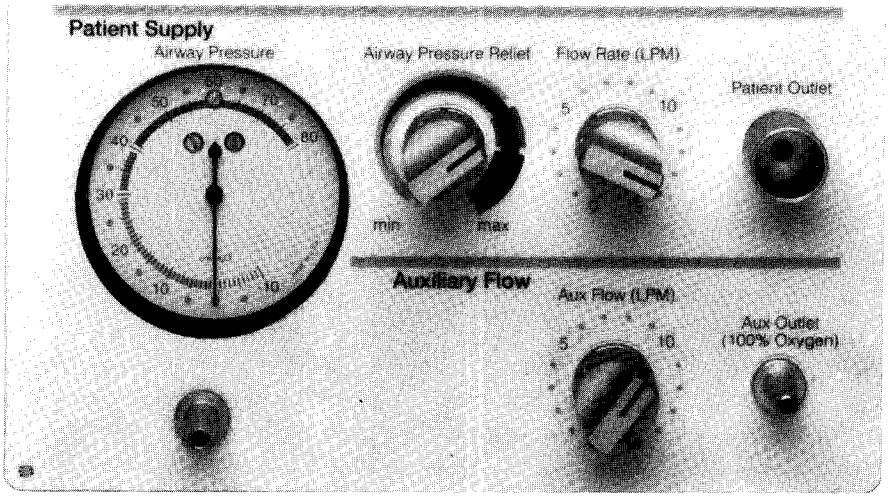


FIGURE 3.2 RESUSCITATION MODULE WITH PATIENT GAS SUPPLY AND AUXILIARY FLOW

- **Patient Gas Supply** –

The **Patient Gas Supply** Circuit may be used to provide continuous gas flow to the patient. Controls are provided for **Airway Pressure Relief** (maximum pressure) and **Flow Rate (LPM)** (circuit flow delivering 100% oxygen or blended gas). The adjustable **Airway Pressure Relief** Control is always operative.

A fixed internal safety relief valve is also provided and is also always operable. This valve provides redundant maximum pressure relief at 50 ± 10 cm H_2O and also allows the patient to inspire room air in the event of gas supply failure.

WARNING: Breathing room air through the 2–way relief valve requires extra effort. This condition, if it occurs, should be rectified as soon as possible.

- **Auxiliary Flow**

The **Aux Flow** circuit supplies 100% oxygen through the **Aux Flow (LPM)** Control to the **Aux Outlet** Connector. It is intended for oxygen enrichment of a manual bag resuscitator, for supplemental delivery to the patient, the mother, or a second neonate, i.e., twins. The **Aux Flow (LPM)** Control adjusts the flow rate from 0 to 15 lpm. An internal preset relief valve limits the **AUX Outlet** pressure to 160 cm H_2O.

- **Airway Pressure**

The Airway Pressure Gauge displays airway pressure when connected to patient circuits via external connection.

- **Patient Breathing and Supply Circuits**

The patient breathing circuit used in conjunction with the Resuscitation Module is illustrated in Figure 3.3. In addition, a patient supply circuit for Manual Bagging (Figure 3.4) may also be used.

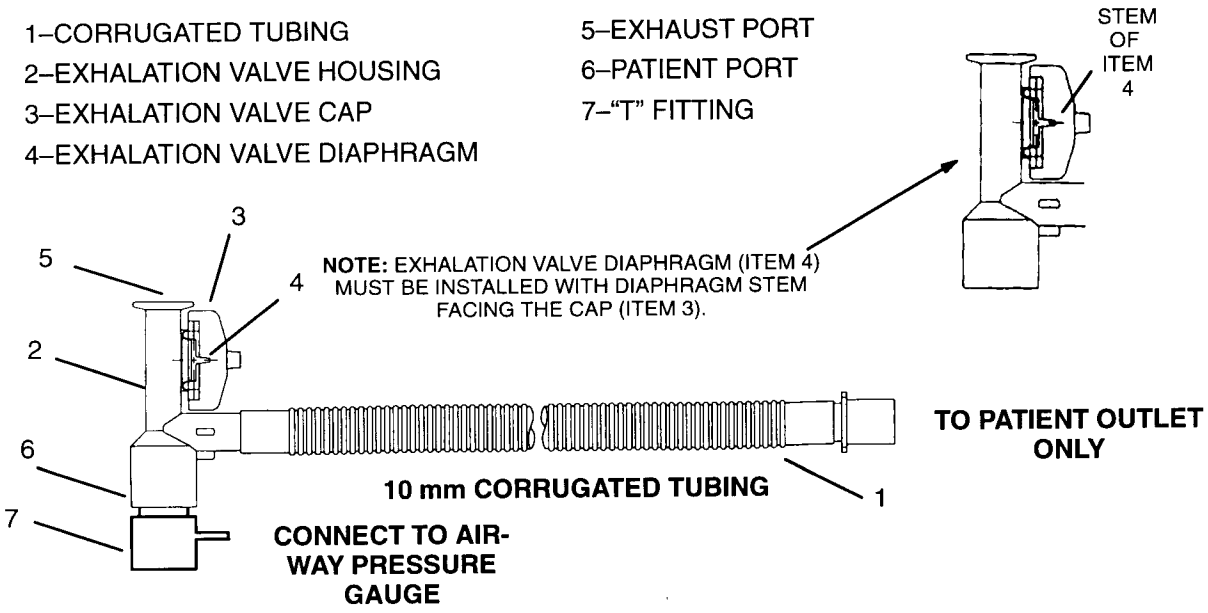

1–CORRUGATED TUBING
2–EXHALATION VALVE HOUSING
3–EXHALATION VALVE CAP
4–EXHALATION VALVE DIAPHRAGM
5–EXHAUST PORT
6–PATIENT PORT
7–"T" FITTING
STEM OF ITEM 4
NOTE: EXHALATION VALVE DIAPHRAGM (ITEM 4) MUST BE INSTALLED WITH DIAPHRAGM STEM FACING THE CAP (ITEM 3).
TO PATIENT OUTLET ONLY
10 mm CORRUGATED TUBING
CONNECT TO AIR-WAY PRESSURE GAUGE

FIGURE 3.3 PATIENT BREATHING CIRCUIT FOR MANUAL VENTILATION

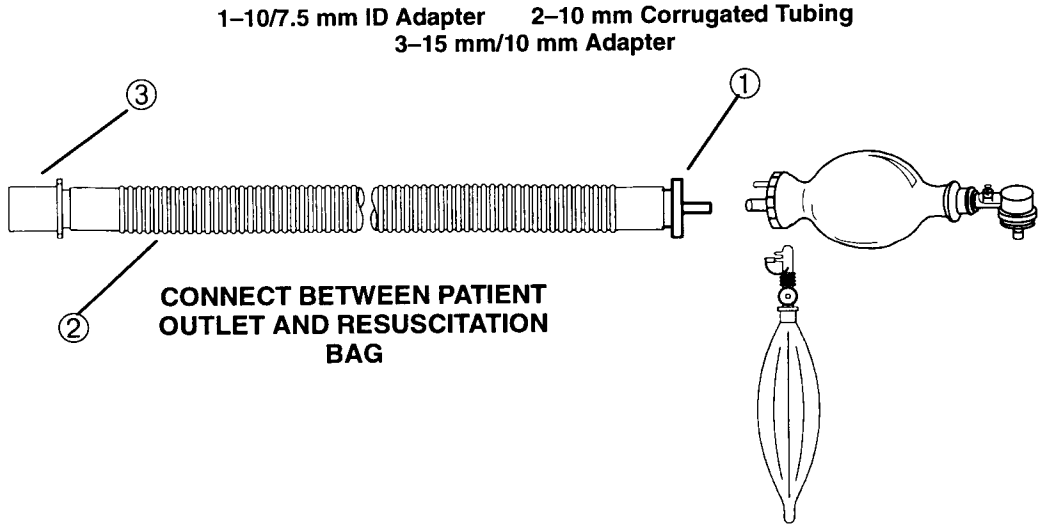


FIGURE 3.4 PATIENT BREATHING CIRCUIT FOR MANUAL BAGGING

3.2.6 GAS SUPPLY MODULE (Optional)

The **Gas Supply** Module includes an On/Off Switch which controls the pipeline and cylinder gas supply to the Resuscitation Module. An oxygen cylinder Pressure Gauge is provided if the Resuscitation option is included. Oxygen and Air Pressure Gauges are provided on units equipped with the Blender Module.

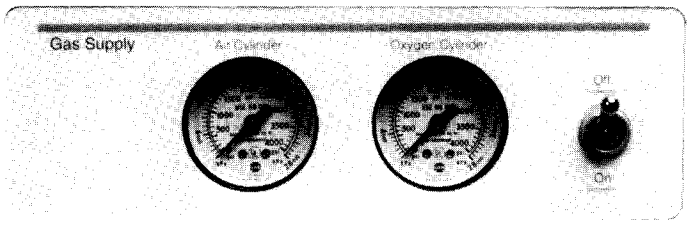


FIGURE 3.5 GAS SUPPLY MODULE

3.2.7 ALARMS

HIGH TEMPERATURE. When the Skin Temperature Probe is attached to the infant and the skin temperature exceeds 39.0 °C, the heater is automatically turned off, the **High Temp** Indicator will flash and the audible alarm will sound continuously. Press the **Silence/Reset** Key to silence the alarm for two minutes. After the alarm condition is corrected (a skin temperature of 38.5 °C or less), the alarm will automatically reset. If the Skin Probe should detect a temperature of 39.5 °C, a hardware shutdown will occur and a **System Fail** Alarm will be generated.

CHECK PATIENT. When in the **Manual** Mode after 10 minutes of operation, the **Chk Patient** Indicator will illuminate and the alarm will sound one time. Thereafter, the **Chk Patient** Indicator will remain illuminated and the audible alarm will sound every 30 seconds for 5 minutes. If the alarm has not been acknowledged at the end of 5 minutes, the heater will be shut down and a continuous ramping audible alarm will sound. The **Silence/Reset** Key then must be pressed to reactivate the heater.

PROBE. If the Skin Temperature Probe fails (short–circuited or open) or if the Controller is in Baby Mode and there is not a Skin Probe connected to the Controller, the **Probe** Indicator will flash and a ramping audible alarm will sound. After the alarm condition is corrected (the Probe is replaced), the alarm will automatically reset.

BABY TEMPERATURE. When the temperature sensed by the Skin Temperature Probe is 1 °C above or 1 °C below the selected **Set Temperature** Display setting (in Baby Mode), the **Baby Temp** Indicator will flash and an audible alarm will sound, first at a low level, then at a medium level, then at a high level. In addition, if the temperature is 0.2 °C above the selected **Set Temperature,** the heater will be turned off automatically. Press **Silence/Reset** to silence the alarm for 10 minutes.

POWER FAIL. When ac power to the unit is interrupted while the Controller is on, the **Power Fail** Indicator will flash and the audible alarm will beep. When power is restored to the unit, the alarm will automatically reset and all the settings will be retained. The alarm may be silenced by turning off the power switch.

SYSTEM FAIL. If an internal malfunction is detected, the **System Fail** Indicator will flash and the audible alarm will beep. In addition, an Error Code (eR00 to eR025) will be displayed in the **Baby Temperature** Display. This alarm is not resettable and the unit should be referred to qualified service personnel. A prolonged brown–out (five minutes or more) will also cause a System Fail alarm.

BLENDER DIFFERENTIAL BYPASS ALARM (Optional). The Blender Module (factory installed option) will alarm and bypass whenever the pressure differential between the O_2 and Air supplies exceeds 30 psi ± 2 psi. When this condition occurs, the blender will continue to supply whichever gas is the higher pressure: either 100% Air or 100% Oxygen. This is an audible alarm only. There are no visual indicators.

3.2.8 APGAR TIMER

When the **Apgar Timer** is running, the Apgar Timer Display will show elapsed minutes and seconds and the audible alarm will sound at the 1–, 5– and 10–minute Apgar time intervals.

SECTION 4
OPERATION

4.1 CONTROLS, INDICATORS AND CONNECTORS

Controls, Indicators and Connectors for the Controller are presented in Figures 4.1 and 4.2 and Tables 4.1 and 4.2. Controls, Indicators and Connectors for the Resuscitation Module are presented in Figure 4.3 and Table 4.3.

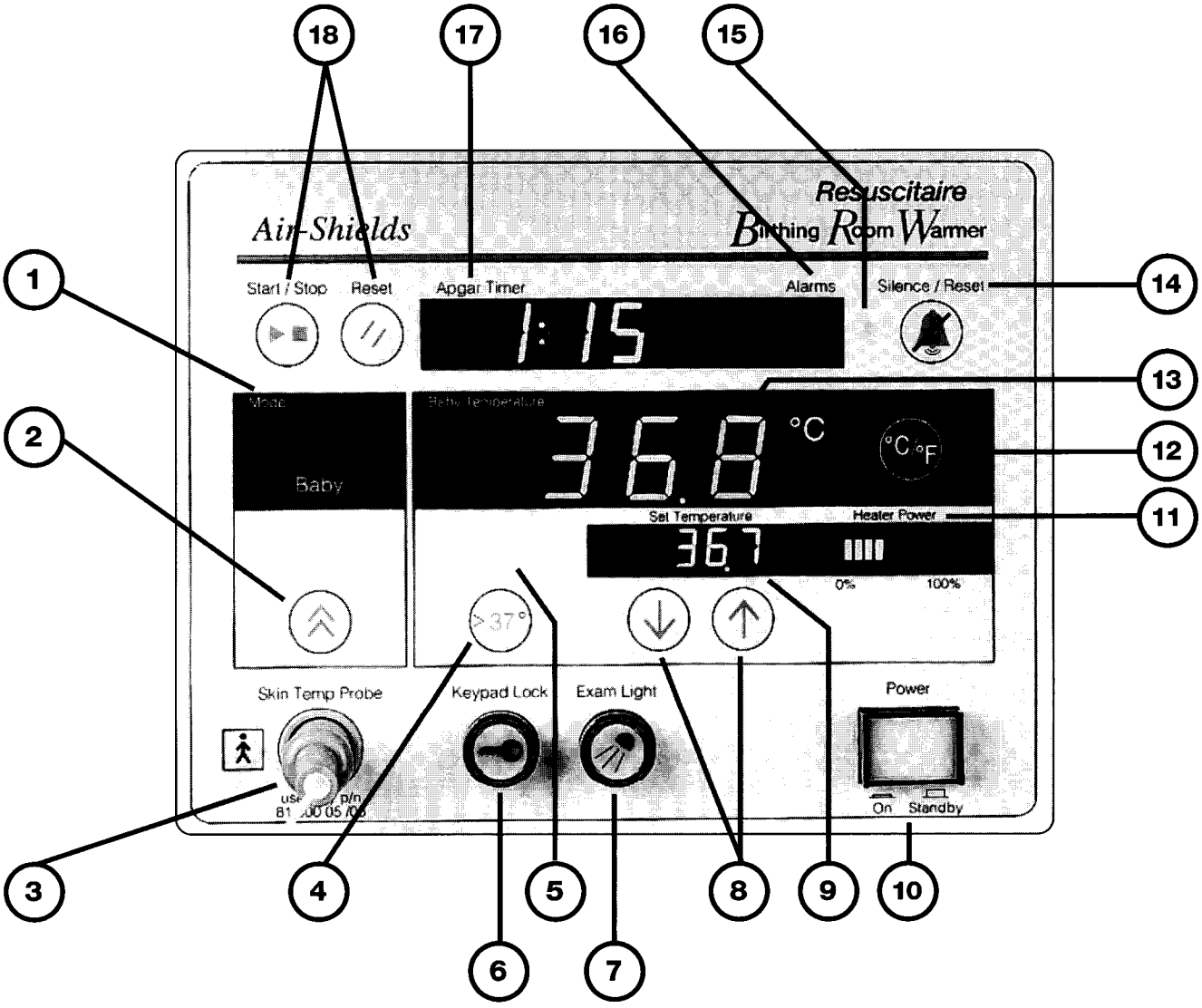


FIGURE 4.1 CONTROLLER FRONT PANEL: CONTROLS, INDICATORS AND CONNECTORS

TABLE 4.1 CONTROLLER FRONT PANEL: CONTROLS, INDICATORS AND CONNECTORS

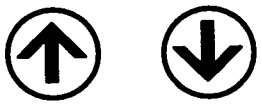
ITEM	NAME	DESCRIPTION
1	**Mode**	
	Pre–Warm Indicator	Indicates that the Controller is operating in the **Pre–Warm Mode**.
	Manual Indicator	Indicates that the Controller is operating in the **Manual Mode**.
	Baby Indicator	Indicates that the Controller is operating in the **Baby Mode**.
2	**Mode** Select Key	Press to select either **Pre–Warm, Manual** or **Baby Mode** of operation.
3	**Skin Temp Probe** Connector	Accepts Skin Temperature Probe for monitoring infant skin temperature. When connected, the **Baby Temperature** Display indicates the temperature sensed by the probe. When probe is disconnected, the **Baby Temperature** Display is blank. When disconnected in **Baby** Mode, a **Probe** Alarm also occurs.
4	**>37 °C** Key	Press to place **Set Temperature** Display (refer to Item 9) in Temperature Override Mode, >37 °C (98.6 °F). ***NOTE:*** *This Key is inactive until the **Set Temperature** has been set to 37.0 °C.*
5	**>37 °C** Indicator	Lights to indicate that the Temperature Override Mode, >37 °C (98.6 °F), has been selected.
6	**Keypad Lock** Key	Press to disable the **>37 °C**, Up/Down Arrow and **Mode** Select Keys (refer to Items 2, 4 and 8). Press again to enable the **>37 °C**, Up/Down Arrow and **Mode** Select Keys. Key lights to indicate that Keypad is locked.
7	**Exam Light** Key	Press to turn on or turn off the Examination Light located in the Warmer Module.
8		**Manual Mode** Press the Up Arrow Key to raise heater power from 0% to 100% in 10% increments (refer to Item 11, **Heater Power** Display). Press the Down Arrow Key to lower relative heater power from 100% to 0% in 10% increments (refer to Item 11, **Heater Power** Display).

TABLE 4.1 CONTROLLER FRONT PANEL: CONTROLS, INDICATORS AND CONNECTORS (cont.)

ITEM	NAME	DESCRIPTION
8		**Baby Mode** Press the Up Arrow Key to raise the Set Temperature from 34.0 °C (93 °F) to 37.0 °C (98.6 °F). In the Temperature Override Mode (refer to Items 4 and 5), press to raise the Set Temperature from 37.0 °C (98.6 °F) to 38.0 °C (102.2 °F). Press one time to raise the Set Temperature in 0.1 degree increments. Press and hold to raise the Set Temperature rapidly. Press the Down Arrow Key to lower the Set Temperature from 37.0 °C (98.6 °F) to 34.0 °C (93 °F). In the Temperature Override Mode (refer to Items 4 and 5), press to lower the Set Temperature from 38.0 °C (102.2 °F) to 37.0 °C (98.6 °F). Press one time to lower the Set Temperature in 0.1 degree increments, Press and hold to lower the Set Temperature rapidly. ***NOTE:*** *The Up/Down Arrow Keys may be locked by the Keypad Lock Key (refer to Item 6).*
9	**Set Temperature** Display	In **Baby Mode,** displays the **Set Temperature** as selected by the Up/Down Arrow Keys (refer to Item 8) in °C or °F as selected by the °**C**/°**F** Key (refer to Item 12). Display is blank in **Pre–Warm** and **Manual** Modes.
10	**Power** Key 	Press to turn on or turn off the Controller and Warmer Module.
11	**Heater Power** Display	Displays relative heater power in 10% increments from 0% to 100%.
12		Press to alternately select °C or °F for the **Baby Temperature** and **Set Temperature** Displays.
13	**Baby Temperature** Display	Digital display of infant temperature in °C or °F (refer to Item 12), whether in **Manual, Pre–Warm** or **Baby Mode**. The display is blank if the Skin Temperature Probe (refer to Item 3) is disconnected from the Controller.

TABLE 4.1 CONTROLLER FRONT PANEL: CONTROLS, INDICATORS AND CONNECTORS (cont.)

ITEM	NAME	DESCRIPTION
14	**Silence/Reset** Key	In **Manual Mode** Press to silence the **High Temp** Alarm (refer to Item 16) for 2 minutes. Resets **Chk Patient** Alarm (refer to Item 16), and silences Audible Alarm at any time after 10 minutes of Manual Mode. Resets **Chk Patient** Alarm (refer to Item 16), silences Audible Alarm and restores heater power after the 15-minute Manual Mode period is complete. In **Baby Mode** Press to silence the **High Temp** Alarm (refer to Item 16) for 2 minutes. Press to silence **Baby Temp** (refer to Item 16) Alarm for 10 minutes. During non-alarm conditions, press to enter Procedural Silence (refer to Item 15).
15	**Procedural Silence** Indicator	When illuminated, indicates that the unit is in Procedural Silence. Procedural silence interval is 5 minutes. During Procedural Silence, the Baby Temp Alarms are blocked.
16	**Alarms**	
	Baby Temp	The **Baby Temp** Indicator will flash with a three-level audible alarm to indicate that the baby's skin temperature is more than 1 °C above or below the selected Set Temperature (refer to Item 9). Press **Silence/Reset** Key to silence alarm for 10 minutes.
	High Temp	The **High Temp** Indicator will flash, the audible alarm will sound continuously, and the heater will be turned off when the Skin Temperature Probe is attached to the infant and the skin temperature exceeds 39.0 °C. High Temp (39.0 °C) Alarms can only be silenced for two minutes by the Silence/Reset Key. Press the **Silence/Reset** Key to silence the audible alarm for 2 minutes. The Alarm condition is corrected when the temperature falls to 38.5 °C; the alarm will automatically reset.
	Probe	When in **Baby Mode**, if the Skin Temperature Probe fails, the **Probe** Indicator will flash and a three-level audible alarm will sound. After the Alarm condition is corrected (the Skin Temperature Probe is replaced), the alarm will automatically reset. Also refer to Table 5.1) When in **Baby Mode,** if the Skin Temperature Probe fails (shorted probe), the **System Fail** Indicator will light and an audible alarm will sound. This Alarm cannot be silenced. The **Power MUST BE TURNED OFF then ON** to reset the alarm condition.

TABLE 4.1 CONTROLLER FRONT PANEL: CONTROLS INDICATORS AND CONNECTORS (cont.)

ITEM	NAME	DESCRIPTION
16	**Alarms (Cont.)** **Chk Patient**	When in the **Manual** Mode, if the Warmer is in operation for longer than 10 minutes, the **Chk Patient** Indicator will illuminate and the audible alarm will sound one time. Thereafter, the **Chk Patient** Indicator will remain on and the audible alarm will sound every 30 seconds for the next 5 minutes. If at the end of 5 minutes (15 minutes total) the alarm has not been acknowledged by pressing the **Silence/Reset** Key (refer to Item 14), the heater will be shut down and a three level audible alarm will sound continuously.
	System Fail	When an internal malfunction is detected, the **System Fail** Indicator will illuminate and the audible alarm will sound continuously. In addition, an Error Code (Er00 to Er025) will be displayed in the **Baby Temperature** Display. When a malfunction is detected, the Controller will automatically perform the self-test function (refer to para. 4.2 Step 3) to determine if the fault has corrected itself. If the fault has not corrected itself, the error code will be displayed until corrected. This alarm is not resettable and the unit should be referred to qualified service personnel. ***NOTE:*** *Error code 023 may be corrected by the Operator; refer to Table 5.1.*
	Power Fail	When power to the unit is interrupted while the Controller is on, the **Power Fail** Indicator will flash and the audible alarm will beep. When power is restored to the unit, the alarm will automatically reset. Push the **Power** Key to silence the Alarm.
17	**Apgar Timer**	When the **Apgar Timer** (refer to Item 18) is running, the Apgar Timer displays elapsed minutes and seconds and the audible alarm will sound at the 1-, 5- and 10-minute Apgar Time intervals.
18	**Stop/Start** 	Press to start or stop the **Apgar Timer**.
	Reset 	When timer is running, press to reset the timer to zero and restart the Apgar count. When timer is stopped, press to turn timer off. ***NOTE:*** *The Timer can be reset at any time.*

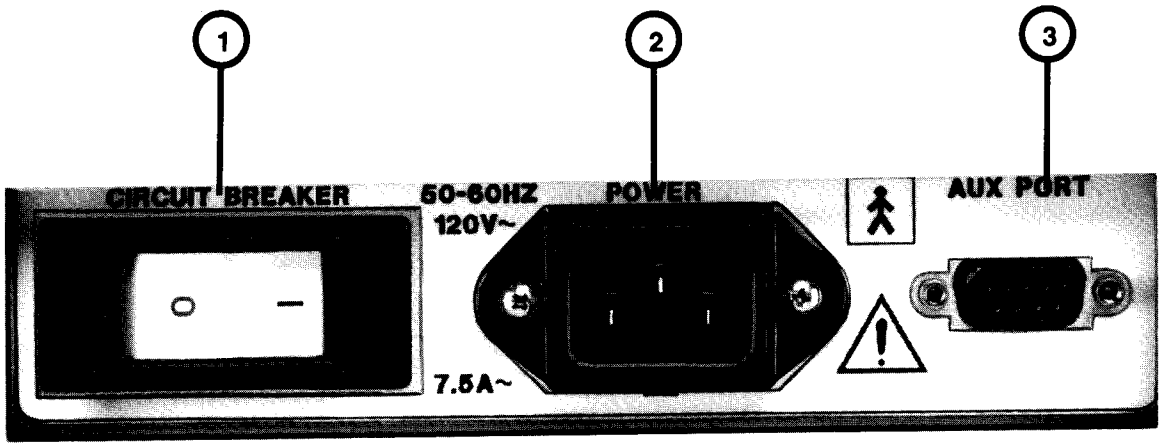


FIGURE 4.2 CONTROLLER REAR PANEL: CONTROLS AND CONNECTORS

TABLE 4.2 CONTROLLER REAR PANEL: CONTROLS AND CONNECTORS

ITEM	NAME	DESCRIPTION
1	CIRCUIT BREAKER	Turns Controller on and off when switched by operator or the presence of excessive current drain is detected.
2	POWER	Accepts ac power cord.
3	AUX PORT	Data port for connection to printer or host system.

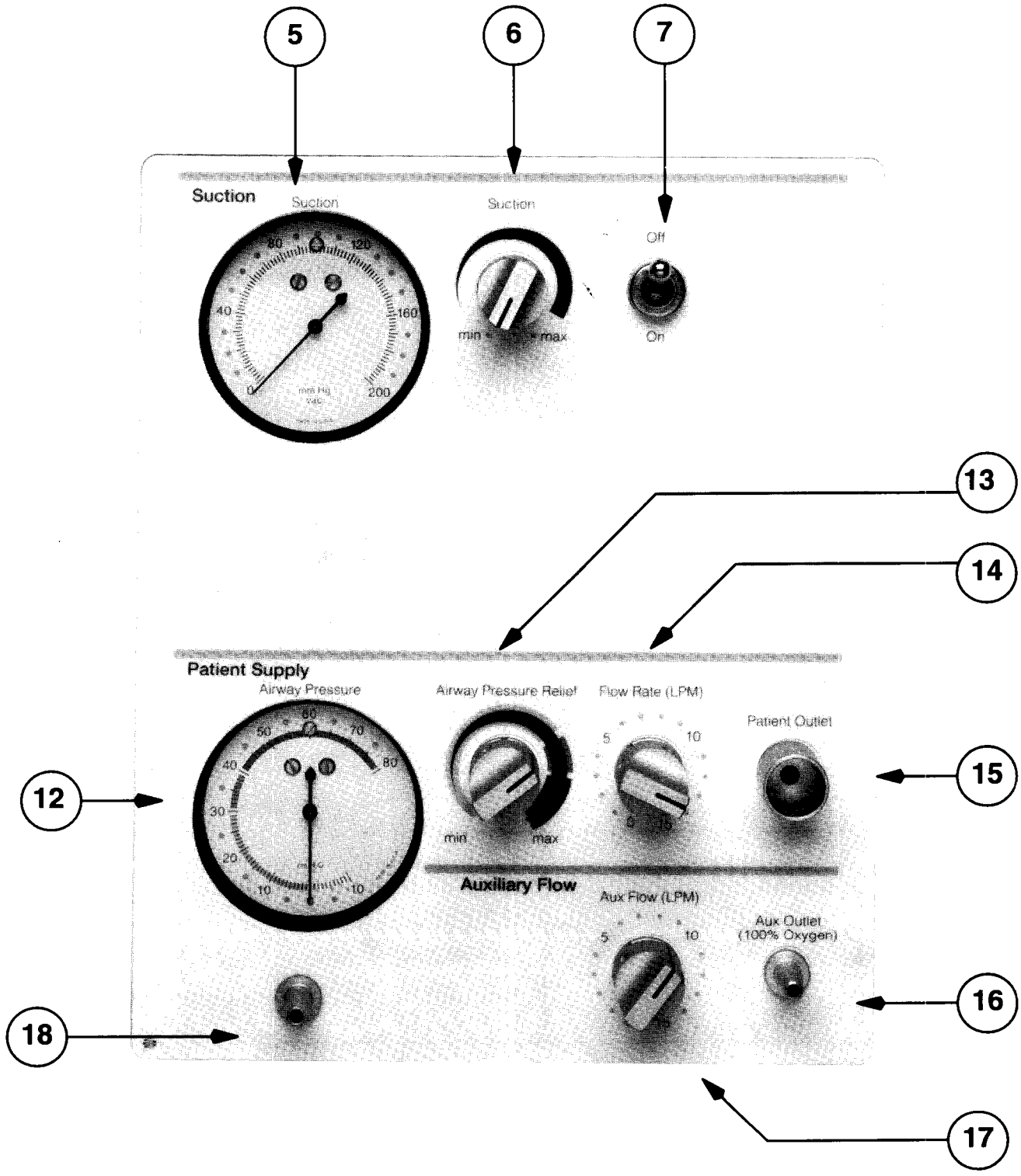


FIGURE 4.3A RESUSCITATION MODULE, INDICATORS AND CONNECTORS

TABLE 4.3A RESUSCITATION MODULE: CONTROLS, INDICATORS AND CONNECTORS

ITEM	NAME	DESCRIPTION
	Suction	
5	**Suction** Gauge	Displays suction level from 0 to 200 mmHg of vacuum.
6	**Suction Min Max** Control	Adjusts suction level from 0 to 150 mmHg of vacuum.
7	**On/Off** Switch	Turns **Suction** on and off.
	Patient Supply	
12	**Airway Pressure** Gauge	Displays airway pressure from –10 to +80 cm H_2O.
13	**Airway Pressure Relief Min Max** Control	Adjusts airway pressure relief setting from 0 to 50 cm H_2O.
14	**Flow Rate (LPM)** Control	Adjusts patient gas flow from 0 to 15 LPM.
15	**Patient Outlet** Connector	Accepts patient circuit outlet line.
	Auxiliary Flow	
16	**Aux Outlet 100% Oxygen** Connector	Accepts auxiliary gas delivery line.
17	**Aux Flow (LPM)** Control	Adjusts auxiliary patient gas flow from 0 to 15 LPM.
18	**Airway Pressure** Port	Connects Airway Pressure Gauge to Patient Circuit.

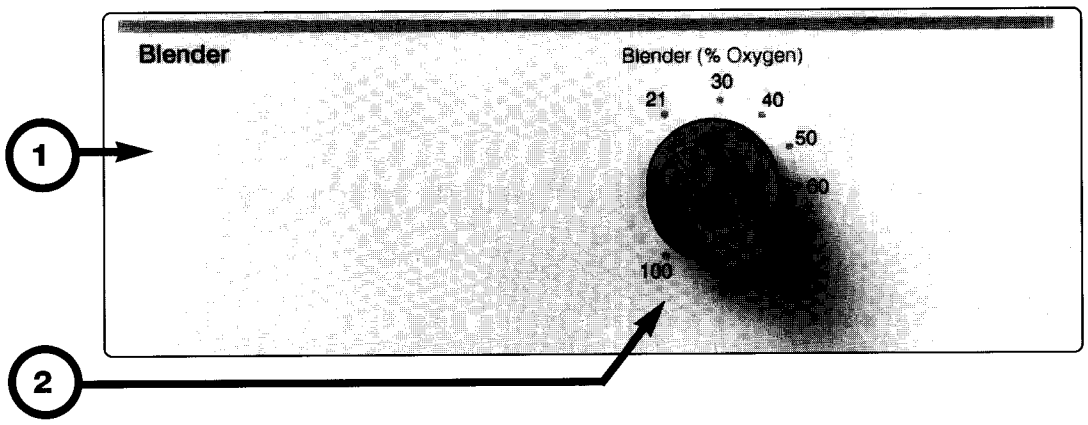


FIGURE 4.3B BLENDED GAS SUPPLY MODULE CONTROL

TABLE 4.3B BLENDED GAS SUPPLY MODULE CONTROL

ITEM	NAME	DESCRIPTION
1	**Blended Gas Supply Module (Optional)**	
2	**Blender % Oxygen** Control	Blends air and oxygen mixture from 21 to 100% O_2.

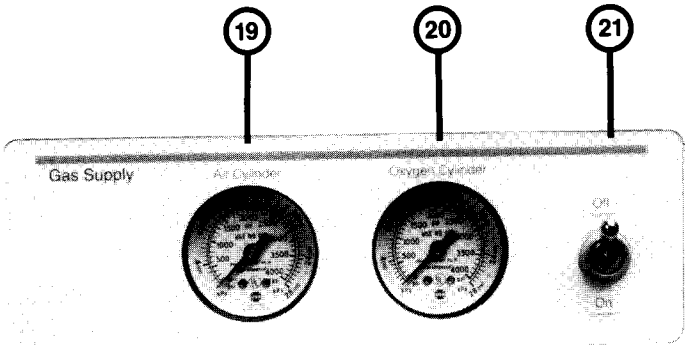


FIGURE 4.3C GAS SUPPLY MODULE: CONTROLS AND INDICATORS

TABLE 4.3C GAS SUPPLY MODULE: CONTROLS AND INDICATORS

ITEM	NAME	DESCRIPTION
	Gas Supply (Optional)	
19	**Air Cylinder** Gauge	Provides indication of air cylinder supply pressure 0 to 4000 psi.
20	**Oxygen Cylinder** Gauge	Provides indication of oxygen cylinder supply pressure 0 to 4000 psi.
21	**Gas Supply On/Off** Switch	Turns gas supply to pneumatic system on and off.

4.2 OPERATIONAL CHECKOUT PROCEDURE - CONTROLLER

WARNING: The Warmer should not be used if the Controller or other parts of the equipment fail to function as described below. A potential shock hazard exists within the Warmer Module. Service should be referred to qualified personnel.

IMPORTANT: *Before attempting to perform this procedure, refer to Paragraph 4.1, Controls, Indicators and Connectors.*

NOTE: *The Operational Checkout procedure should be performed before each use and after disassembly for cleaning, servicing or maintenance. Refer to qualified service personnel if the unit does not perform as specified.*

1. **CONNECT THE AC LINE CORD TO THE POWER CONNECTOR** on the Rear Panel.

WARNING: Connect the power cord only to a properly grounded wall receptacle that is approved for hospital-use and of the correct voltage. DO NOT use extension cords or an ac Receptacle Box for this device.

2. **CHECK THE SELF-TEST FUNCTION.** Turn on the **Power** Switch, the Self-Test Function should be initiated and the following should occur:
   - **Apgar Timer, Baby Temperature** and **Set Temperature** Digital Displays show all eights
   - All **Alarm** Indicators light (except **Power Fail**)
   - All **Mode** Indicators light
   - The **> 37 °C** Indicator lights
   - All ten segments of the **Heater Power** Indicator light
   - The Procedural Silence Indicator lights
   - The **Keypad Lock** Switch lights
   - The audible alarm will sound a high pitch tone, a low pitch tone, then a beep-beep-beep

   When the Self-Test Function is complete, the Controller should begin operating in the **Pre-Warm Mode**.

3. **CHECK THE PRE-WARM MODE.** The **Pre-Warm** Indicator should be on and the **Heater Power** Indicator should display 10 segments (100%) for three minutes, reduce to 6 segments (60%) for 12 minutes, then reduce to 3 segments (30%).

4. **CHECK THE MANUAL MODE.** Select **Manual Mode** by pressing the **Mode** Select Key. The **Manual** Indicator should light.

   Press the Up Arrow Key until all the **Heater Power** Display segments are lit. Press the Down Arrow Key until all the **Heater Power** Indicators are off. Connect the skin temperature probe to the **Skin Temp Probe** Connector, the **Baby Temperature** Display should come on.

   Attach the Skin Temperature Probe to the Mattress, with a Probe Cover, to prevent Error Code 18.

   Set the **Heater Power** Indicator to 100%, all segments are lit. Wait 10 minutes. After 10 minutes have elapsed, the **Chk Patient** Indicator should come on and the audible alarm should sound one time. Wait an additional 5 minutes. During this time the audible alarm should sound at 30-second intervals. At the end of 5 minutes (15 total), the heater should shut down and the **Heater Power** Indicators should go off. Press the **Silence/Reset** Key, the **Chk Patient** Indicator and audible alarm should go off and the heater should come back on along with the **Heater Power** Indicators.

5. **CHECK THE KEYPAD LOCK.** Press the **Keypad Lock** Switch. The **Keypad Lock** Switch should light up. The **Mode** Key and Up/Down Arrow Keys should be inoperative. Press the Keypad Lock Switch. The **Keypad Lock** Switch Light should go off and the Keypad should be enabled.

6. **CHECK THE BABY MODE.** Select **Baby Mode** by pressing the Mode Select Key. The **Baby** Indicator should light and the **Set Temperature** Display should read 36.5 °C. In addition, the **Baby Temp** Indicator should flash and the audible alarm should sound. Press the **Si-**

lence/Reset Key, the audible alarm should go off, the **Baby Temp** Indicator should remain on.

7. **CHECK THE TEMPERATURE OVERRIDE MODE.** Press the Up Arrow Key to raise the **Set Temperature** to 37.0 °C. Press the **>37 °C** Key, the **>37 °C** Indicator should come on. Press the Up Arrow Key to raise the **Set Temperature** to 38.0 °C.

   Press the Down Arrow Key to lower the **Set Temperature** to below 37.0 °C. When the **Set Temperature** falls below 37.0 °C, the **>37 °C** Indicator should go off.

8. **CHECK THE PROBE ALARM.** Disconnect the skin temperature probe from the **Skin Temp Probe** Connector. The **Baby Temperature** Display should go off, the **Probe** Indicator should flash and the audible alarm should sound. Connect the probe to the **Skin Temp Probe** Connector.

9. **CHECK THE APGAR TIMER.** Press the **Start /Stop** Key, the **Apgar Timer** Display should come on and begin to count up from zero seconds. Press the **Start/Stop** Key, the **Apgar Timer** count should stop. Press the **Reset** Key, the **Apgar Timer** Display should go off.

10. **CHECK THE EXAMINATION LIGHT.** Press the **Exam Light** Switch. The Examination Light should come on. Press the Exam Light Switch, the Examination Light should go off.

11. **CHECK THE POWER FAILURE ALARM.** Turn off the **CIRCUIT BREAKER** on the Rear Panel. Turn on the **Power** Switch on the Front Panel. The **Power Fail** Indicator should come on and the Audible alarm should sound. Turn off the **Power** Switch and turn on the **CIRCUIT BREAKER.** Disconnect the Skin Temperature Probe from the **Skin Temp Probe** Connector and the Mattress.

NOTE: *The unit must be connected to the ac line and power turned on for at least three minutes before the **Power Fail** circuitry becomes active.*

4.3 MECHANICAL CHECKOUT

1. **CHECK THE BASSINET TILT CONTROL** (Figure 4.4) by pulling up on the lever located at the bottom rear of the Bassinet while supporting the rear lower edge of the Bassinet with the palm. Place the Bassinet in the 5-degree and then the 10-degree tilt position; return the Bassinet to the level position.

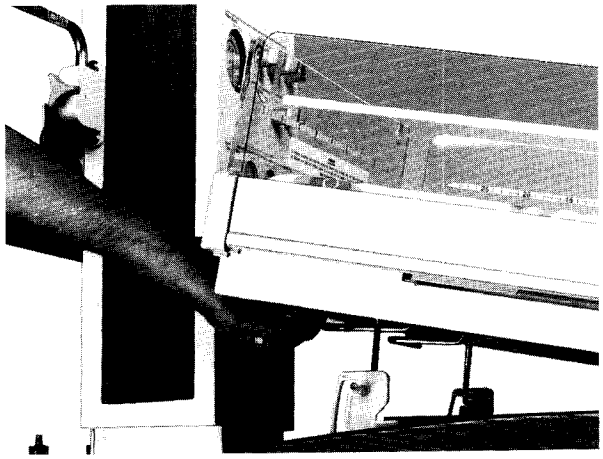


FIGURE 4.4 CHECKING BASSINET TILT CONTROL

2. **CHECK THE BASSINET SIDE PANELS** (Figure 4.5) by raising each panel and pivoting it to hang straight down. Return the panel by reversing the procedure. Check that the panel is positively engaged to confine the infant.

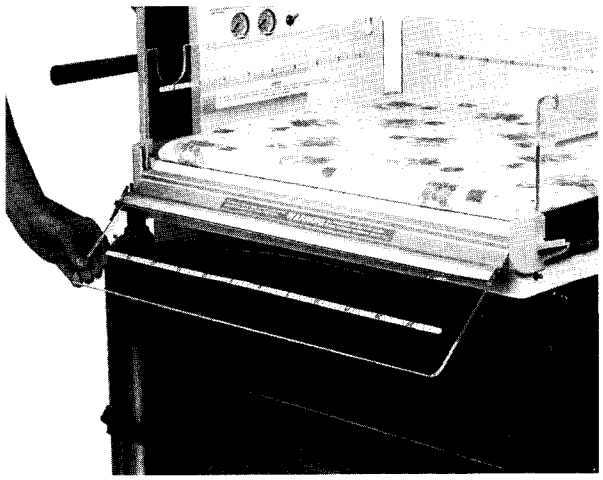


FIGURE 4.5 CHECKING THE BASSINET SIDE PANELS

3. **CHECK THE BASSINET FRONT PANEL** (Figures 4.6 and 4.7) by raising the panel and sliding it under the mattress. Return the panel by reversing the procedure. Check that the panel is positively engaged to confine the infant.

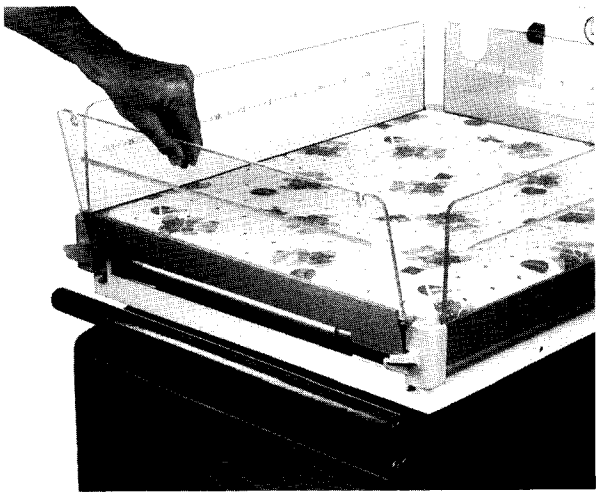


FIGURE 4.6 CHECKING THE BASSINET FRONT PANEL

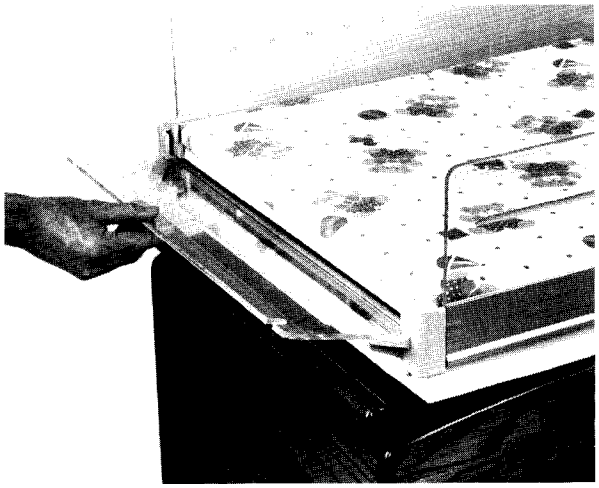


FIGURE 4.7 CHECKING THE BASSINET FRONT PANEL

4. **CHECK THE PASS–THROUGH DRAWER** (Figure 4.8) by sliding the drawer in and out on both sides of the Cart/Bassinet. Return to center position.

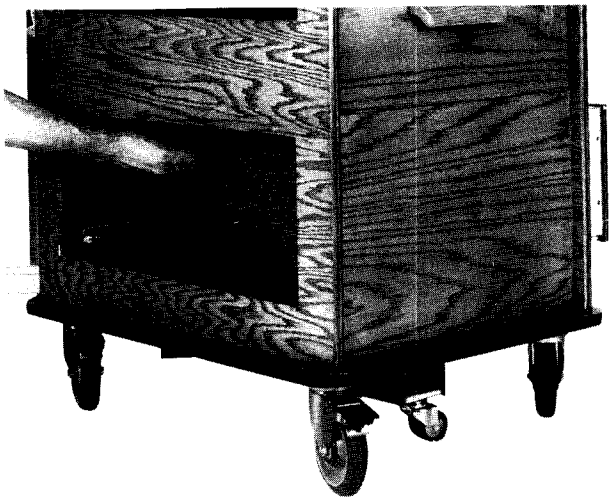


FIGURE 4.8 CHECKING THE PASS–THROUGH DRAWER

5. **CHECK THE WARMER MODULE SWIVEL OPERATION** (Figure 4.9) by rotating the Warmer Module 90 degrees to the left or right of center. Return to center position.

PRECAUTION: *For effective heating, make sure the Warmer Module is positioned on the center axis and locked with its detent.*

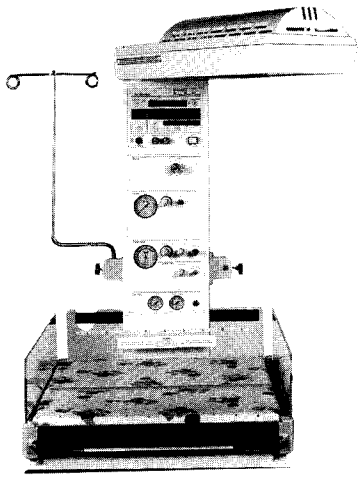


FIGURE 4.9 CHECKING THE WARMER MODULE SWIVEL

6. **CHECK THE OPERATION OF THE X–RAY CASSETTE TRAY (ACCESSORY)** (Figure 4.10) by grasping the middle of a Side Panel and pulling the X–ray Cassette Tray out from under the Bassinet. Replace the X–ray Cassette Tray by reversing the procedure.

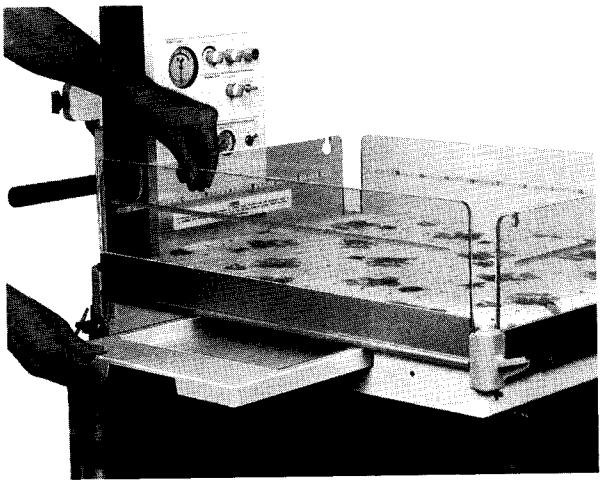


FIGURE 4.10 CHECKING THE X–RAY CASSETTE TRAY

7. **CHECK THE WRITING SURFACE** (Figure 4.11) by pulling it out from under the Bassinet. Replace the Writing Surface by reversing the procedure.

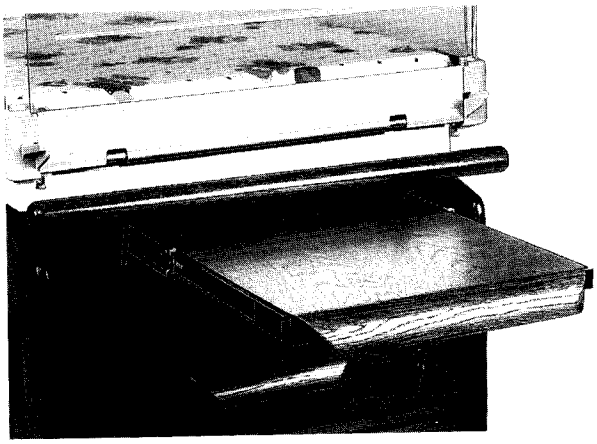


FIGURE 4.11 CHECKING THE WRITING SURFACE

8. **CHECK THE CART/BASSINET DOCKING MECHANISM AND CASTER LOCKS.** Refer to paragraph 4.7 and undock the Cart. Depress the Caster Locks (Figure 1.1) and check that they prevent the Cart from moving. Release the Caster Locks and dock the Cart/Bassinet.

   Pull on the Cart/Bassinet to ensure that it is latched properly.

4.4 RESUSCITATION EQUIPMENT PRE–USE CHECKOUT AND SETUP (Optional)

4.4.1 SUPPLY PRESSURE

1. Ensure that O_2 (and AIR) pipeline(s) are securely attached to appropriate fittings on the rear of the unit and that gas supply present is 40 to 75 psi.

If using Reserve Gas Supply from cylinders:

2. Ensure that cylinder(s) are properly secured in the mounting yokes on the rear of the Warmer and that the cylinder valve located on the top of the cylinder is open.
3. Examine the appropriate cylinder pressure gauges on the front of the upper column to ensure that sufficient reserve gas supply is present.
4. Set the handle of the **Gas Supply On/Off** Switch to the **On** position.

4.4.2 BLENDED GAS SUPPLY PRE–USE CHECKOUT AND SETUP (Optional)

LOW FLOW MICROBLENDER WARNINGS:

- **If either the air or oxygen gas source pressure is reduced or increased, creating a pressure differential of 30 psi, the microblender alarm will sound. This condition significantly alters the FiO_2 and flow output from the microblender.**
- **Always operate the low flow microblender with clean/dry medical grade gases.**
- **Air inlet water filters are recommended for use with the low flow microblender.**
- **The concentration of oxygen provided and the partial pressure of oxygen within the patient's blood (PaO_2) should be monitored.**

1. If present, turn the precision blender knob to ensure free rotation.
2. Remove either the oxygen or air supply (pipeline or cylinder). The blender alarm should sound. Replace the supply.
3. Set the blender to the desired % oxygen concentration.

4.4.3 RESUSCITATION MODULE PRE-USE CHECKOUT AND SETUP (Optional)

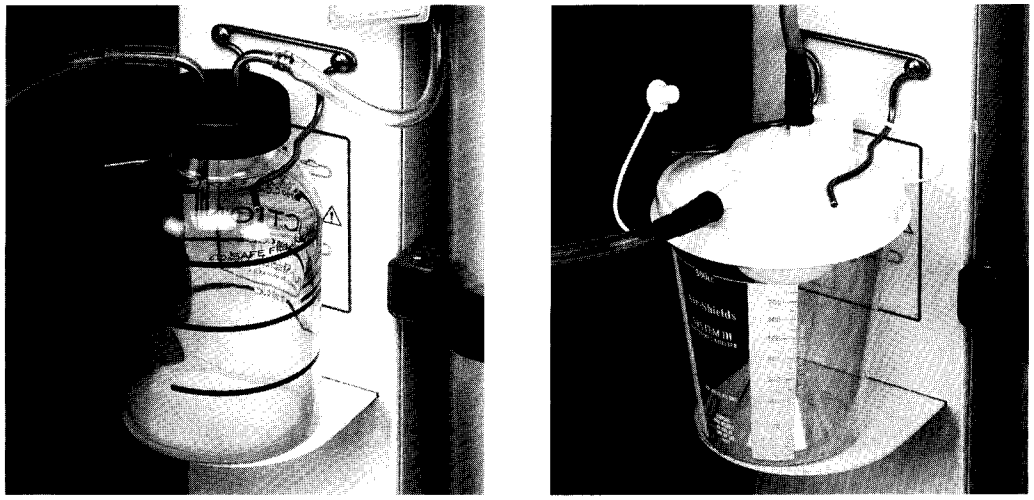


FIGURE 4.12 CHECKING THE SUCTION BOTTLE

SUCTION

NOTE: *To obtain suction, the* ***Gas Supply On/Off*** *Switch (Figure 4.3C) must be* ***ON.***

1. Check that a clean suction bottle (reusable or disposable, Figure 4.12) is installed and properly connected at the base of the Warmer column.
2. Ensure that a bacterial filter is connected in-line with the supply connection to the reusable suction bottle (a filter is built-in on the disposable bottle).
3. Connect the desired extension tubing to the outlet of the suction bottle outlet port (refer to Figure 3.1) and secure the free end of the extension tubing in either tubing retaining slot provided on the front and rear panels of the Bassinet.
4. Turn on the **Suction On/Off** Switch. There may be an initial reading of up to 30 mmHg on the Suction Gauge (refer to Figure 3.1) due to flow resistance of the hydrophobic filter and suction tubing.

NOTE: *The filter and tubing resistance will not affect the desired maximum value that is set in Step 5 below. The pressure value on the Suction Gauge matches the actual pressure value at the end of the catheter.*

5. Block the patient outlet of the suction bottle. Adjust the suction magnitude using the **Suction Min Max** Control while viewing the suction level on the **Suction** Gauge. Adjust the suction magnitude to the desired maximum suction pressure value.
6. Turn off the **Suction On/Off** Switch.

RESUSCITATION (Optional)

Manual Resuscitation – Use with Patient Breathing Circuit – 10 mm tubing with thumb (finger) hole at patient end.

WARNING: Excessive airway pressure can cause damage to patient's lungs. Always monitor airway pressure and/or provide appropriate pressure relief during resuscitation.

WARNING: For prolonged ventilation, use of a heat and moisture exchanger is recommended.

There are potential hazards associated with the delivery of supplemental oxygen. If it is necessary to administer oxygen, the attending physician should be notified immediately.

1. Connect the Patient Circuit to the **Patient Outlet** (refer to Figures 3.2, 3.3 and 3.4).

2. Adjust the flow rate to the desired fresh gas flow rate using the **Patient Supply Flow Rate (LPM)** Control.

3. Set the **Airway Pressure Relief** control to the desired pressure limit according to the color coded bands on the **Airway Pressure** Gauge and **Airway Pressure Relief** Control. Alternately, a "T" Fitting with an airway pressure monitor port can be inserted into the **Patient Outlet** Port and connected to the **Airway Pressure** Fitting to indicate the breathing circuit pressure. Adjust the **Airway Pressure Relief** Control as necessary.

4.5 CONTROLLER OPERATION

WARNING: Connect the power cord only to a properly grounded wall receptacle that is approved for hospital–use and of the correct voltage. DO NOT use extension cords or an ac Receptacle Box for this device.

Connect the unit to the ac line. Turn on the **CIRCUIT BREAKER** on the Rear Panel and the **Power** Switch on the Front Panel. Observe the Functional Test.

4.5.1 PRE–WARM MODE

After the Functional Test is complete, the **Pre–Warm Mode** will activate. The **Heater Power** Indicator will be at 100% (all lights on) for three minutes, reduce to 60% (six lights on) for 12 minutes and then be reduced to 30% (three lights on).

NOTE: *Selection of **Manual** or **Baby Mode** and then returning to **Pre–Warm Mode** during the three minutes of 100% or 12 minutes of 60% power will automatically reduce the power to 30%.*

During **Pre–Warm** Mode, the **Chk Patient** Alarm is disabled.

WARNING:

To avoid overheating or underheating, observe the infant constantly and monitor the temperature using the skin temperature probe supplied with the equipment or other electronic thermometer.

Inspect infant's skin for reddened areas which may result from heating of materials in contact with the skin (plastic diapers, pins, etc.).

Avoid placement of objects (equipment, blankets, or clothing) between the infant and Warmer Module that can block heat transfer or absorb heat. These objects may be heated directly by the heater and can cause skin burns.

Radiant warming increases insensible water loss. Appropriate measures to maintain fluid balance should be considered.

4.5.2 MANUAL MODE

1. Use the Mode Key to select **Manual Mode**.

2. Use only for short–term warming with nursing personnel in constant attendance.

3. Do not use the Warmer in **Manual Mode** if **Manual** Indicator is not on.

4. Set the **Heater Power** Indicator to the desired level. The heater power will be maintained for 10 minutes.

5. After 10 minutes, the **Chk Patient** Alarm will activate. Press the **Silence/Reset** Key to initiate another 10–minute warming period.

6. If the **Chk Patient** Alarm is not acknowledged, the heater will be automatically disabled after an additional 5 minutes of operation.

7. Heater power output must be adjusted manually to maintain Baby Temperature within the desired range.

8. Check infant's temperature and condition at least every 15 minutes. When initially setting or when changing heater power output, check Baby Temperature more frequently to be sure it is maintained within the desired range.

CAUTION: A change in heater power output will not result in an immediate change in Baby Temperature. Wait for results. Large changes in heater power output will cause a more rapid change in Baby Temperature.

9. Use Skin Temperature Probe to continuously monitor Baby Temperature whenever possible. Refer to paragraph 4.5.3 to attach the probe to the patient.

IMPORTANT: *In **Manual Mode**, the Skin Temperature Probe monitors only -- it does not control heater output and the Baby Temp alarms are not functional.*

NOTE: *It is not necessary that the Skin Temperature Probe be connected to the Controller for **Manual Mode**.*

4.5.3 BABY MODE

1. Use the Mode Key to select **Baby Mode**.

2. Plug Skin Temperature Probe into Controller **Skin Temp Probe** Connector.

3. Attach the Skin Temperature Probe to the infant. The probe should be located on the infant's abdomen, halfway between the xyphoid and the umbilicus (Figure 4.13). The metal side of the probe should be placed in direct contact with the skin.

WARNING:

Infant radiant warmers should be used only by properly trained personnel as directed by an appropriately qualified physician aware of currently known hazards and benefits.

To avoid hazards of overheating or underheating, the infant should not be left unattended. Use only with the Hill-Rom Air-Shields Skin Temperature Probe supplied with the unit. Inspect the infant's skin for reddened areas which may result from heated materials in contact with the skin (plastic diapers, pins, etc.).

Dressing the infant or swaddling with a blanket during radiant warming can lead to skin temperature variations which can cause Set Point Temperature alarms. Always uncover or undress the infant during radiant warming to prevent excessive skin temperature variations.

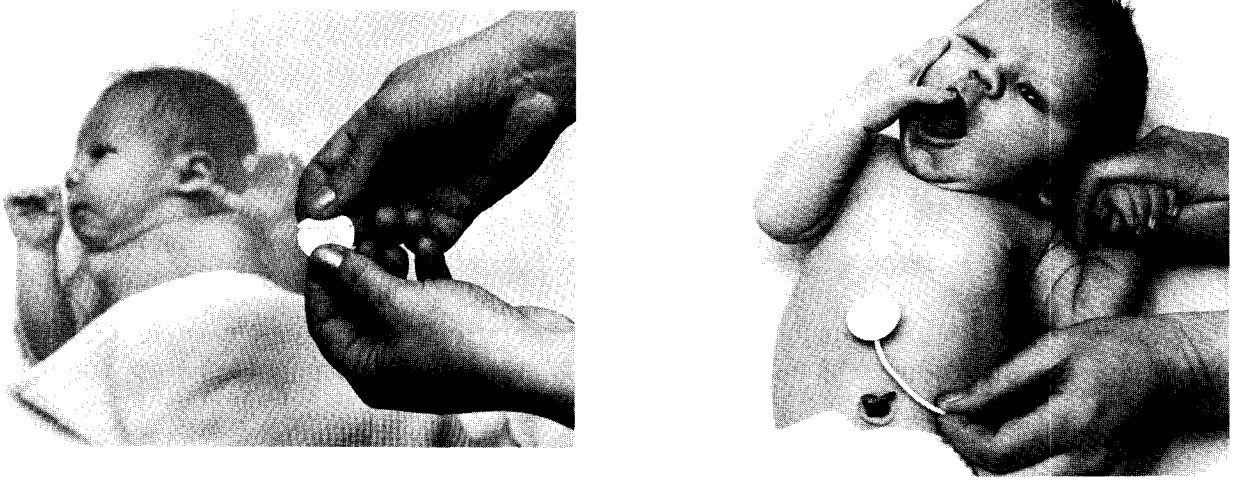


FIGURE 4.13 ATTACHING SKIN PROBE

WARNING:
The location of the Skin Temperature Probe must be such that the skin around the Sensor is in direct line with the heat from the Warmer Module. If the location is shadowed, for example, by the infant's body, overheating and possible burning of the infant's skin can result. Do not use a rectal probe. Use of a rectal probe can result in overheating of the infant.

The Skin Temperature Probe must be in direct contact with the skin to provide accurate monitoring of the infant's skin temperature. Failure to maintain intimate skin contact can result in overheating and possible burning. Check infant's condition at least every fifteen minutes for correct Sensor attachment and feel infant's skin for signs of overheating.

The Skin Temperature Probe should be placed at least 1.5 inches from any transcutaneous monitor ($TcPO_2$ or $TcPCO_2$) probe to prevent false temperature indications. The Skin Temperature Probe should not be placed on an area previously used by a $TcPO_2$ or $TcPCO_2$ probe.

4. When the infant is prone, the Skin Temperature Probe should be located on the infant's back.

5. The skin area around the probe should be thoroughly cleansed and dried before the probe is placed on the skin.

6. To obtain an accurate reading of the infant's skin temperature, place the probe in position and cover with a Critter Covers® Disposable Probe Cover, Care–For–Me Cover or tape the probe into position, cover it with a small piece of cotton just large enough to cover the tip of the probe, and then place a second piece of tape over the cotton. If it is desired to reduce tape contact on the infant's skin, the cotton can be applied directly to the probe tip without the first piece of tape. To stabilize the attached probe, a third piece of tape may be placed over the probe wire approximately three to four centimeters from the probe tip.To minimize the effect of direct radiation on the Skin Temperature Probe, in order to obtain a more accurate **Baby Temperature** measurement, cover the Sensor with a Critter Covers® Disposable Probe Cover, Care–For–Me Cover or an equivalent insulating foam cover with a reflective surface facing the Warmer Module.

7. Baby Mode should be used for long–term warming and when attending personnel cannot be in constant attendance.

8. Set the **Set Temperature** Display to the prescribed temperature. A higher Set Temperature setting does not increase rapid warming.

9. Verify that **Baby Temperature** Display reading stabilizes within 0.2 °C of **Set Temperature** Display. Fluctuations in the **Heater Power** Indicators or the **Baby Temperature** Display reading can result from air currents, obstruction of radiation to the infant or the Skin Temperature Probe not being in intimate contact with the skin.

10. **Baby Temp** Alarms can be silenced for 10 minutes by pressing the **Silence/Reset** Key.

11. **Baby Temp, Probe** and **High Temp** (39.0 °C) Alarms are automatically reset after the alarm condition is corrected.

12. The **High Temp** Alarm may be silenced for 2 minutes by pressing the **Silence/Reset** Key.

NOTE: *In the event of a **Probe** Alarm, **Manual Mode** can be used temporarily until a replacement Skin Temperature Probe is available and only if nursing personnel are in constant attendance.*

4.5.4 EXAMINATION LIGHT

The light is turned on and off by the **Exam Light** Switch. Turn the light on only as required for optimum bulb life.

WARNING: Protect infant's eyes to minimize risk of injury.

4.6 CART/BASSINET

CAUTION: Do not attempt to move the Cart/Bassinet by using the acrylic End and Side Panels as a handle.

1. The End and Side Panels raise and pivot to hang down (refer to Figures 4.5, 4.6 and 4.7).

2. The Bassinet Tilt Control (Figure 4.4) operates by pulling up on the lever located at the bottom rear of the Bassinet while supporting the rear lower edge of the Bassinet with the palm. Place the Bassinet in the 5–degree or the 10–degree tilt position.

4.7 DOCKING AND UNDOCKING THE CART/BASSINET

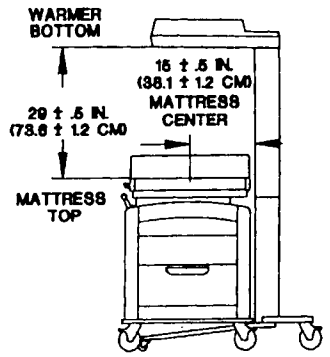
1. The Cart/Bassinet is attached to the Warmer by a latching mechanism located underneath the Cart/Bassinet which attaches to a stud protruding from the Warmer center leg.

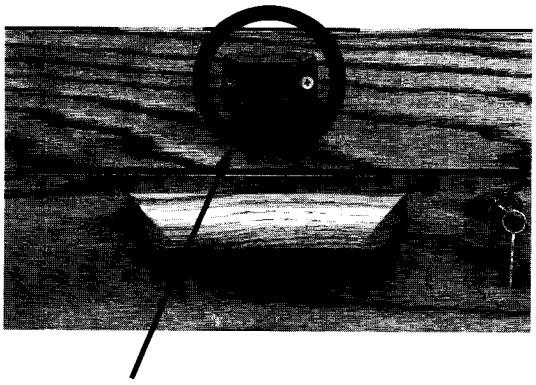
   To engage the Cart/Bassinet to the Warmer, push the Cart/Bassinet straight onto the Warmer until it latches. To release the Cart/Bassinet, push and hold the Release Switch on the front of the Cart/Bassinet (Figure 4.14) and pull the Cart/Bassinet away from the Warmer.

WARNING:

- **This Warmer is intended for use with infants in the Cart/Bassinet. If the Warmer is used to warm the mother immediately after delivery, all warnings and instructions should be followed with a particular regard to heater–to–mattress distance and skin probe location. Avoid placement of objects near the mother which can absorb heat and become hot to the touch.**
- **When repositioning the mattress with an infant on the mattress, hold the infant securely to prevent the infant from moving during repositioning.**
- **Do not leave infant unattended when the panels are down. When transporting the infant in the Cart/Bassinet, the Mattress should be in the horizontal position. All panels must be erect and secure during transport.**

⚠ PRECAUTION
FOR PATIENT SAFETY CART MUST BE PROPERLY DOCKED AND LATCHED TO ENSURE CORRECT BASSINET POSITIONING FOR EFFECTIVE HEATING.





PRESS AND HOLD TO RELEASE CART.

FIGURE 4.14 CART/BASSINET RELEASE SWITCH

4.8 X–RAY PROCEDURES

1. Swing the Warmer Module (Figure 4.9) to the right or left of center as required to position the X–ray machine.

2. Lift the Left or Right Bassinet Side Panel up, slide the X–ray Cassette Tray out (Figure 4.10); place the X–ray Cassette on the tray and return the tray to the Bassinet. Align the tray as desired with the markings on the X–ray Cassette and relative markings on the inside of the Bassinet walls.

3. When the X–ray is complete, remove the X–ray Cassette and return the X–ray Cassette Tray. Place the Warmer Module in its normal operating position.

SECTION 5
CLEANING AND MAINTENANCE

5.1 GENERAL

This section provides cleaning and maintenance instructions. Where necessary, disassembly instructions are provided. Maintenance other than that provided in this section should be performed only by qualified service personnel.

WARNING:

If oxygen is in use, make sure that the oxygen supply to the equipment is turned off and that it is disconnected from the oxygen supply when performing cleaning and maintenance procedures. A fire and explosion hazard exists when performing cleaning and/or maintenance procedures in an oxygen–enriched environment.

An electrical shock hazard exists when performing cleaning and maintenance procedures; make sure that the Power Cord is disconnected from the wall receptacle.

5.2 CLEANING

When an infant is discharged, or at least once a week, the equipment should be thoroughly disinfected. Cleaning can most effectively be accomplished by disassembling, then grouping the parts and/or assemblies in categories according to the method of cleaning required.

5.3 DISASSEMBLY FOR CLEANING

1. Remove both Bassinet Side Panels (Figure 5.1) by pulling them straight up.

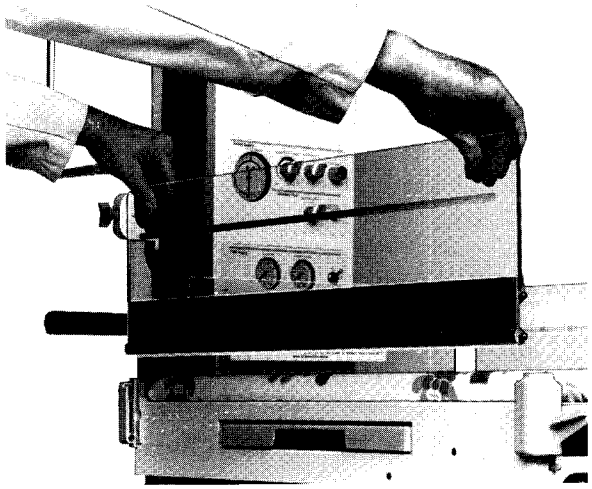


FIGURE 5.1 REMOVING BASSINET SIDE PANELS

2. Remove the Bassinet Back Panel (Figure 5.2) by raising it straight up until the bottom pins are adjacent to the slots in the corner brackets.

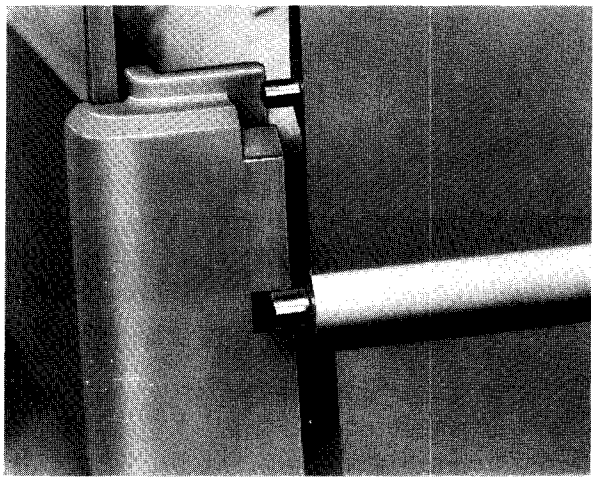


FIGURE 5.2 REMOVING BASSINET BACK PANEL

3. Remove the Bassinet Front Panel (Figure 5.4) by raising it and then swiveling it down. At the corners, press up on the release buttons (Figure 5.3) and pull the panel straight out.

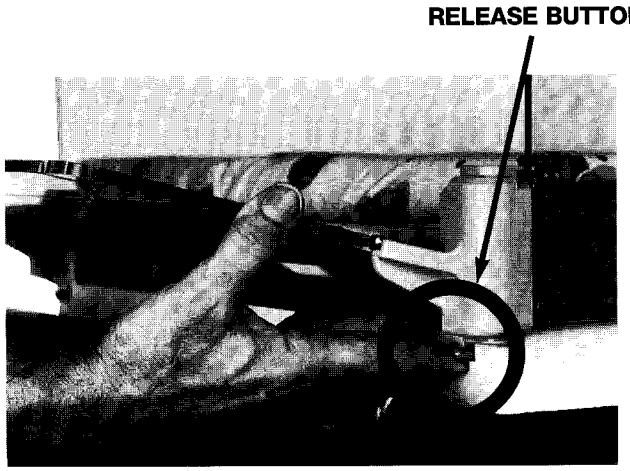


FIGURE 5.3 BASSINET FRONT PANEL RELEASE BUTTONS

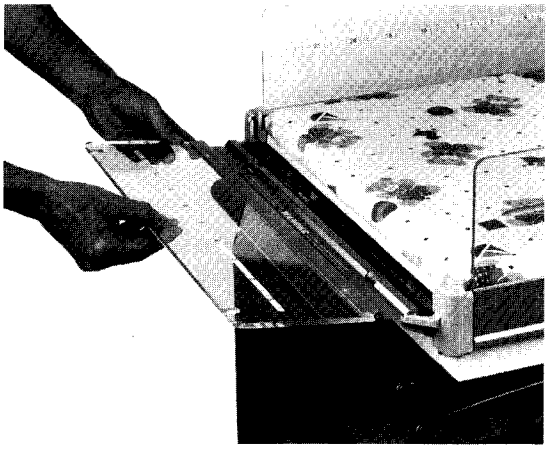


FIGURE 5.4 REMOVING BASSINET FRONT PANEL

4. Remove the Mattress from the Bassinet.

5. Remove the X–ray Cassette Tray (Figure 4.10).

6. Remove the Suction Bottle and Filter (Figure 4.12) from the side of the column.

5.4 CLEANING PROCEDURES

When an infant is discharged, or at least once a week, the equipment should be thoroughly cleaned and disinfected.

5.4.1 CLEANING AGENTS

An iodophor or quaternary disinfectant–detergent registered by the U.S. Environmental Protection Agency should be used, but only when the equipment is not in use and disassembled as described elsewhere in this section. A cleanser such as Kleen-aseptic®b Germicidal Surface Cleanser may be used. When using any cleaning agent, follow the manufacturer's directions for use. Before cleaning, remove all solid wastes and contaminants from the disassembled parts.

5.4.2 PAINTED SURFACES

Use a disinfectant–detergent to clean all surfaces thoroughly; then dry with a clean cloth or paper towel.

5.4.3 CLEAR PLASTIC AND ACRYLIC SURFACES

CAUTION: Alcohol can cause crazing of plastic and acrylic. Do not use alcohol, acetone, or any organic solvents for cleaning.

Do not expose plastic and acrylic to direct radiation from germicidal lamps. Ultraviolet radiation from these sources can cause cracking and crazing of clear plastic and acrylic.

Use a disinfectant–detergent to clean all surfaces thoroughly. Make sure to clean all holes, indentations, etc.; then dry with a clean cloth or paper towel.

5.4.4 METAL SURFACES

Use a disinfectant–detergent to thoroughly clean all surfaces; then dry with a clean cloth or paper towel.

5.4.5 WOODEN SURFACES

Use a disinfectant–detergent to thoroughly clean all surfaces; then dry with a clean cloth or paper towel.

5.4.6 SKIN TEMPERATURE PROBE, REUSABLE

CAUTION: Do not pull on the tip of the skin temperature probe when cleaning or drying; damage to the probe may result.

Use a disinfectant–detergent to thoroughly clean all surfaces; then dry with a clean soft cloth or paper towel.

IMPORTANT: *After cleaning, a complete operational checkout procedure should be performed before returning the unit to service.*

5.5 STERILIZATION

CAUTION: DO NOT STEAM AUTOCLAVE. Gas sterilization temperature should not exceed 54.4 °C (130 °F).

Sterilization can be accomplished with the following:

A. COLD STERILIZATION

CAUTION: Do not expose plastic and acrylic to direct radiation from germicidal lamps. Ultraviolet radiation from these sources can cause cracking of gasket surfaces, fading of paint, and ultimately, crazing of plastic and acrylic.

B. GAS STERILIZATION (ETHYLENE OXIDE). Prior to gas sterilization, the entire unit should be thoroughly cleaned as described elsewhere in this section. Remove and discard all used disposable elements. New disposable elements should be installed after sterilization.

Standard gas sterilization procedures, as programmed by automatic equipment such as made by American Sterilizers and Wilmot Castle, are satisfactory as these do not normally exceed 54.4 °C (130 °F).

IMPORTANT: *After sterilization, a complete functional checkout procedure should be performed before returning the unit to service.*

5.6 REASSEMBLY AFTER CLEANING

1. Replace the Mattress on the Bassinet.
2. Replace the X–ray Cassette Tray (Figure 4.10).
3. Replace the Bassinet Back Panel by inserting the pins in the Corner Brackets (Figure 5.2).
4. Replace the Bassinet Side Panels by pushing them straight down into their slots (Figure 5.1).
5. Replace the Bassinet Front Panel by sliding it into the Front of the Bassinet (Figure 5.4) until the release tabs catch. Raise the Panel into position.
6. Install a new Suction Filter if a Reusable Bottle is in use (Figure 4.12). Replace the Suction Bottle if a Disposable Suction Bottle is in use.

5.7 CALIBRATION

The equipment should be completely checked and calibrated at least once a year by qualified service personnel. Refer to the appropriate Service Manual for details.

5.8 TROUBLESHOOTING

Troubleshooting for the operator of the equipment is presented in Table 5.1. If the fault cannot be localized from the chart, the unit should be removed from use and referred to factory trained or otherwise qualified service personnel.

TABLE 5.1 TROUBLESHOOTING

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
No Power and **Power Fail** Alarm is not activated	a. Circuit Breaker not set to On.	a. Set Circuit Breaker to On.
Power Fail Alarm activated	a. Circuit Breaker tripped. b. Power Cord unplugged. c. Defective Power Cord.	a. Reset Circuit Breaker (Figure 4.2). b. Connect Power Cord to POWER connector (Figure 4.2) or wall socket. c. Replace Power Cord.
System Fail Alarm activated	a. Internal malfunction.	a. Refer to service.
Probe Alarm activated.	Possible Defective Skin Probe(s).	a. Check to ensure Skin Probe is in good contact with the skin. b. Replace Skin Probe(s). If condition is not corrected, refer to service.
Error Code Er01 through Er022 Er024 and Er025	a. Internal malfunction.	a. Refer to service.
Error Code Er023	Ambient Temperature in excess of 32 °C (90 °F).	Verify ambient temperature with an external thermometer.

SECTION 6
PARTS LIST

6.1 GENERAL

This section provides a listing of Operator replacement parts. Parts other than those listed here should be replaced by qualified service personnel. For a listing of accessories, refer to Figure 1.1 of this manual.

REPLACEMENT PARTS	PART NUMBER
Bassinet Side Panel	81 900 00
Bassinet Rear Panel	81 900 01
Bassinet Front Panel	81 900 02
Power Cord	17 AZ 104
Skin Temperature Probe (Reusable)	81 300 05
Reusable Suction Bottle Kit (750 ml) (Bottle, Stopper, Tubing and Filter)	81 001 50
Reusable Suction Bottle Only	08 131 00
Filters (Box of 25)	81 001 54
Mattress/Cover (Mattress with Cover)	78 120 20

DISPOSABLES	
Premi-Probe® Skin Temperature Probe® (Box of 10)	81 300 08
Premi-Probe® Skin Temperature Probe® (10 Boxes of 10)	81 300 09
Critter Covers® Probe Cover (Box of 100)	68 209 46
Critter Covers® Probe Cover (Box of 600)	68 209 45
Care-for-Me Probe Covers, 100 Large (10% discount when you order 5)	68 209 47
Care-for-Me Probe Covers, 100 Standard (10% discount when you order 5)	68 209 48
Patient Supply Circuit (Box of 25)	81 001 27
Infant Breathing Circuit (Box of 25)	81 000 06
Neat Clips - 3/8" Diameter (Box of 100)	68 120 53
1.00" Diameter (50/Case)	68 120 54
Disposable Suction Bottle and tubing, 800 ml (Box of 100)	81 001 51
Disposable Suction Bottle and tubing, 800 ml (Box of 20)	81 001 49

OPTIONS	
Air Hose Assembly, USA (10 ft) Yellow w/Wing Nuts	78 464 10
Oxygen Hose Assembly, USA (10 ft) Green w/Wing Nuts	78 465 10
X-ray Cassette Tray	81 100 44
Monitor Shelf	82 001 54
I.V. Pole	82 001 53